ENCLOSURE (1)

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION
01 STATE: 25
02 SITE NUMBER:

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site): Naval Weapons Industrial Reserve Plant (NWIRP) Bedford

02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER: Hartwell Road

03 CITY: Bedford

04 STATE: MA | 05 ZIP CODE: 01730 | 06 COUNTY: Middlesex | 07 COUNTY CODE: 017 | 08 CONG DIST: 02

09 COORDINATES LATITUDE: 41° 42' 34" N | LONGITUDE: 071 21' 18" W

10 DIRECTIONS TO SITE (Starting from nearest public road):
NWIRP Bedford is located in Bedford MA, approximately 25 miles west of Boston.

III. RESPONSIBLE PARTIES

01 OWNER (If known): DCASPRO (U.S. Navy)
02 STREET (Business, mailing, residential): 2 Wayside Ave
03 CITY: Burlington
04 STATE: MA | 05 ZIP CODE: 01803 | 06 TELEPHONE NUMBER: (617) 274-5336

07 OPERATOR (If known and different from owner): Raytheon Co.
08 STREET (Business, mailing, residential): Hartwell Road
09 CITY: Bedford
10 STATE: MA | 11 ZIP CODE: 01730 | 12 TELEPHONE NUMBER: (617) 274-5336

13 TYPE OF OWNERSHIP (Check one)
☐ A. PRIVATE ☐ B. FEDERAL: Navy (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER: ______ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
☒ A. RCRA 3001 DATE RECEIVED: unknown (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: / / (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
☒ YES ☐ NO DATE: April 1986 (MONTH DAY YEAR)
BY (Check all that apply): ☐ A. EPA ☐ B. EPA CONTRACTOR ☐ C. STATE ☐ D. OTHER CONTRACTOR ☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: ______ (Specify)
CONTRACTOR NAME(S): RGH

02 SITE STATUS (Check one): ☐ A. ACTIVE ☐ B. INACTIVE ☐ C. UNKNOWN

03 YEARS OF OPERATION: 1952 (BEGINNING YEAR) | (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED:
Incinerator ash containing metals from paint waste & photo wastes
#6 Fuel oil

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION:
There is low ground water migration potential due to low hydraulic conductivities of glacial deposits, swamps surrounding the activity and very poor drainage in swampy areas. It's also unlikely for surface runoff from the activity since swamps surround the activity.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
☐ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☒ C. LOW (Inspect on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT: Al Buner | 02 OF (Agency/Organization): NWIRP Bedford | 03 TELEPHONE NUMBER: (617) 274-5336

04 PERSON RESPONSIBLE FOR ASSESSMENT: Bud Stutzer | 05 AGENCY: | 06 ORGANIZATION: NEESA | 07 TELEPHONE NUMBER: (205) 982-3441 | 08 DATE: 4 / 14 / 88 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MA	

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- [x] A. SOLID
- [ ] B. POWDER, FINES
- [ ] C. SLUDGE
- [ ] D. OTHER ________ (Specify)
- [ ] E. SLURRY
- [x] F. LIQUID
- [ ] G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS 1

CUBIC YARDS ________

NO. OF DRUMS ________

03 WASTE CHARACTERISTICS (Check all that apply)

- [ ] A. TOXIC
- [ ] B. CORROSIVE
- [ ] C. RADIOACTIVE
- [ ] D. PERSISTENT
- [ ] E. SOLUBLE
- [ ] F. INFECTIOUS
- [ ] G. FLAMMABLE
- [ ] H. IGNITABLE
- [ ] I. HIGHLY VOLATILE
- [ ] J. EXPLOSIVE
- [ ] K. REACTIVE
- [ ] L. INCOMPATIBLE
- [ ] M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE	200	gallons	#6 Fuel oil
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS	1140	lbs	Contained in Ash from incinerator

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
IOC	Photo waste silver	999	LF	Unknown	
OLW	Fuel oil	999	TK	" "	
MES	zink	7440666	LF	" "	
MES	lead	7439921	LF	" "	
MES	Chromium	7440473	LF	" "	

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Employee interviews

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE: MA
02 SITE NUMBER:

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☐ A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: unknown
04 NARRATIVE DESCRIPTION

01 ☐ B. SURFACE WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: unknown
04 NARRATIVE DESCRIPTION

01 ☐ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: NA
04 NARRATIVE DESCRIPTION

01 ☐ D. FIRE EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: NA
04 NARRATIVE DESCRIPTION

01 ☐ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: NA
04 NARRATIVE DESCRIPTION

01 ☐ F. CONTAMINATION OF SOIL — 02 ☐ OBSERVED (DATE: 1982 April) ☐ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: 0.5 (Acres)
04 NARRATIVE DESCRIPTION

Tank estimated to have leaked, releasing 200 gallons of #6 Fuel oil; incinerated paint & photo waste

01 ☐ G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: NA
04 NARRATIVE DESCRIPTION

01 ☐ H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: NA
04 NARRATIVE DESCRIPTION

01 ☐ I. POPULATION EXPOSURE INJURY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: NA
04 NARRATIVE DESCRIPTION

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE | 02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: NA) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NA

01 ☐ K DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

NA

01 ☐ L CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NA

01 ☐ M UNSTABLE CONTAINMENT OF WASTES (Spills, Runoff, Standing liquids, Leaking drums) — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ 04 NARRATIVE DESCRIPTION

NA

01 ☐ N DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NA

01 ☐ O CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NA

01 ☐ P ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NA

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

NA

III. TOTAL POPULATION POTENTIALLY AFFECTED: ______

IV. COMMENTS

NA

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NA

REFERENCES

Naval Energy Environmental Support Activity (NEESA), 1986. Initial Assessment Study for Naval Weapons Industrial Reserve Plant.

Haley & Aldrich, Inc., 1987. Installation Restoration Program, Phase IV-A, Hanscom AFB Area 1; Appendix F - Architect/Engineer Remedial Investigation Interpretive Report.

U.S. Geological Survey (USGS), 1979. Topographic Quadrangle (7 1/2 - minute) for Concord, Massachusetts.

U.S. Geological Survey (USGS), 1971. Topographic Quadrangle (7 1/2 - minute) for Lexington, Massachusetts.

U.S. Geological Survey (USGS), 1979. Topographic Quadrangle (7 1/2 - minute) for Billerica, Massachusetts.

U.S. Department of Commerce, 1981. Census of Population, Number of Inhabitants, Massachusetts.

U.S. Environmental Protection Agency (USEPA), 1984. Uncontrolled Hazardous Waste Site Ranking System: A User's Manual (HW-10).

CHAPTER 3. RECOMMENDATIONS

3.1 INTRODUCTION. Neither of the two sites identified at NWIRP Bedford poses a potential threat to human health or to the environment. Therefore, no Confirmation Studies are recommended for phase two of the Navy Assessment and Control of Installation Pollutants (NACIP) program.

3.2 RECOMMENDATIONS FOR MONITORING. The normal process of the first phase of the NACIP program, the Initial Assesment Study, has found that significant sources of ground water contaminants do not exist. The NACIP program thus would normally end with this report.

However, with a contaminated well field (the Hartwell Road Well Field) that serves the town of Bedford, it would be prudent for the Navy to further demonstrate the cleanliness of the Bedford activity through a ground water monitoring program. Because of the difficulty of proving that an area is clean (as opposed to contaminated), a monitoring program consisting of 10 shallow ground water monitoring wells and periodic monitoring of surface outflows for additional parameters for a period of 1 year is recommended.

The major contaminant of concern at the public well field is trichloroethylene (TCE) (Camp, Dresser, & McKee, 1984). TCE is less viscous than water, and it is also more dense. Therefore, when TCE enters the ground water system it migrates rapidly through the saturated zone to the first limiting zone, which is the bedrock. The physical characteristics of TCE dictate the type of monitoring well system needed to detect its possible presence; the monitoring wells should extend to the top of the bedrock, where the TCE is most likely to be found. Moreover, wells should be screened to collect water samples from just above the bedrock.

Figure 3-1 illustrates one possible configuration for the placement of monitoring wells. It is laid out radially, to monitor the Components Laboratory and other waste generating facilities on the activity.

3.2.1 <u>Recommended Monitoring Well Program</u>. (Figure 3-1)

Ground Water Monitoring Wells:		Install 10 shallow monitoring wells at locations shown in Figure 3-1.
Type of sample:	Ground water:	One sample taken quarterly from each well, 40 samples annually.
	Surface water:	One sample quarterly from discharge points (NPDES permitted outfalls)

Test parameters: Total dissolved solids, pH, total organic carbon (TOC), volatile organics, silver, iron, lead, sulphate, copper, chromium, TCE.

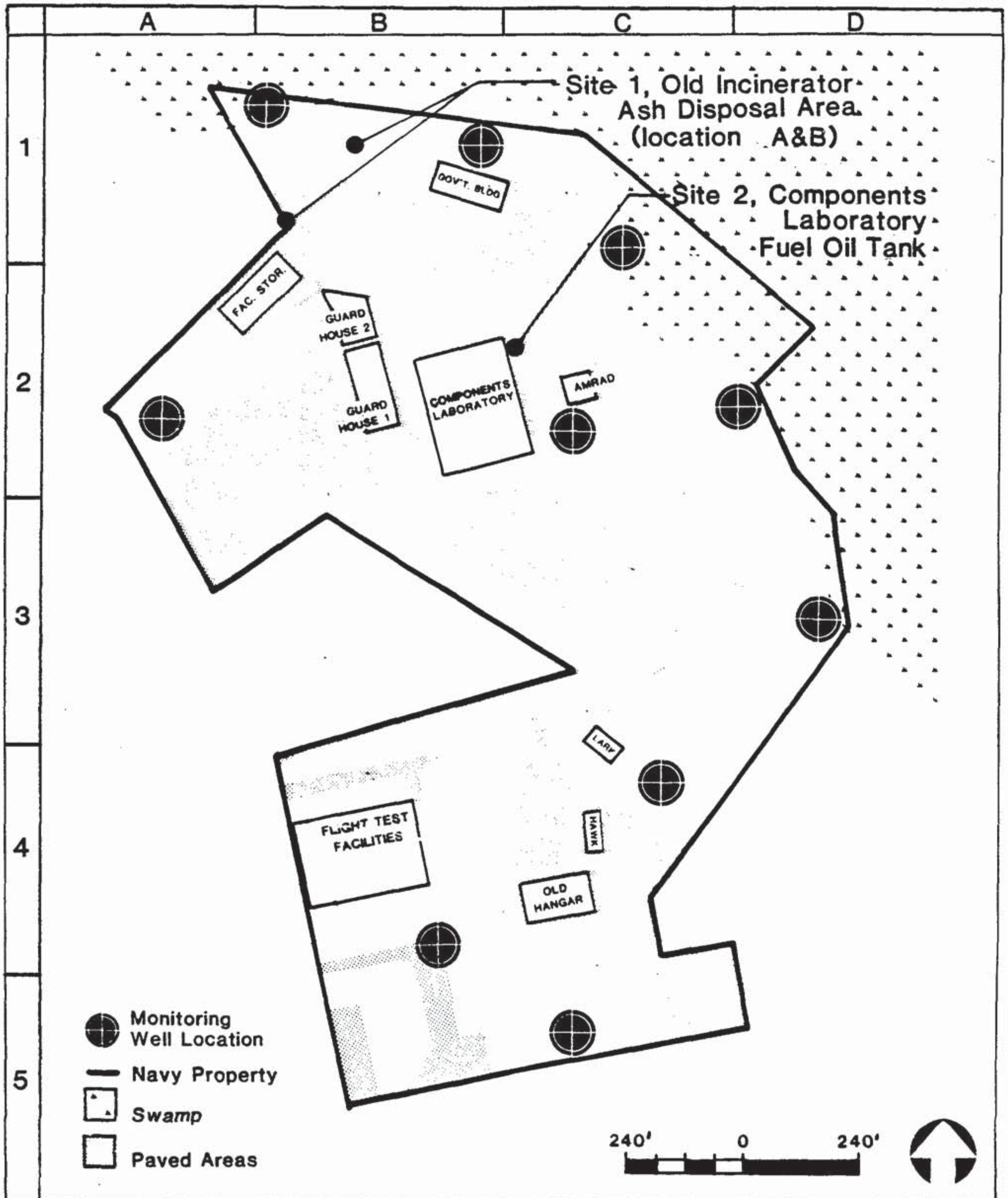

Figure 3-1

A Possible Configuration for Placement of Monitoring Wells, NWIRP Bedford, Massachusetts

Initial Assessment Study
Naval Weapons
Industrial Reserve Plant
Bedford, Massachusetts

Remarks: Monitoring wells should extend to, and be screened at, the bedrock. Ground water levels should be measured quarterly at the NWIRP monitoring points, and at the Hanscom monitoring wells nearest to NWIRP; surface water level in Elm Brook and at the National Pollutant Discharge Elimination System (NPDES) outfalls should also be monitored.

CHAPTER 4. BACKGROUND

4.1 GENERAL. The Naval Weapons Industrial Reserve Plant (NWIRP) Bedford is located in the town of Bedford in Middlesex County, Massachusetts, approximately 25 miles west of Boston (Figure 1-1).

The plant is government-owned and contractor-operated (GOCO) by Raytheon Company. Raytheon owns the majority of the 133-acre industrial plant site, and the Navy owns approximately 46 acres. Raytheon's Missile System Division conducts research and development work throughout the entire plant site. This report addresses hazardous waste generation, handling, and disposal practices on Navy-owned land only.

NWIRP Bedford conducts advanced-technology research in weapons systems development. Approximately 900 people work at NWIRP Bedford, which is comprised of two main structures: the Components Laboratory and the Flight Test Facility (FTF). There are also scattered auxiliary buildings and an incinerator. Many of these structures were built in the early 1950's and are metal-sided or reinforced concrete. In addition, there is an Antenna Range and a warehouse for storage of test and excess equipment, residual parts, and fabricated components. Most of NWIRP Bedford is paved. No testing is conducted outside; all such work takes place in enclosed structures.

NWIRP Bedford's mission is to design, fabricate, and test prototype equipment, such as missile guidance and control systems. In the Components Laboratory, hardware prototypes are fabricated, assembled from components, and run through vibration, drop, and non-destructive testing. The Components Laboratory building also has ample office space and areas for spray painting, welding, machining, and photographic work. FTF supports flight testing of product models and consists of a hangar, an aircraft maintenance area, and office spaces. FTF can support captive missile tests, ground-to-air flyovers, and air-to-air flight tests.

4.2 ADJACENT LAND USES. NWIRP Bedford lies in the western Boston suburbs. The activity adjoins the Raytheon facilities, Hanscom Air Force Base (to the south), Massachusetts Institute of Technology's instrumentation laboratory hangar and test lab (to the west), and the Air Force's Cambridge Research Center (to the south).

Bedford NWIRP and its surroundings are in flat to gently rolling wooded land. There are also extensive marshy, poorly drained areas. Although there is a trailer park associated with Hanscom Air Force Base that lies between the north and south sides of NWIRP Bedford and the area is zoned residential, it is sparsely populated. The nearest residence to NWIRP Bedford, with the exception of the Air Force trailers, is about 200 yards to the northwest.

NWIRP Bedford is accessible from the east and west by a network of highways, including Route 128, Boston's circumferential expressway.

4.3 HISTORY. NWIRP Bedford was created in 1952. Construction of a missile and radar development laboratory (which would become known as the Components Laboratory) began on October 23 of that year. Then known as the Naval Industrial Reserve Aircraft Plant (NIRAP), DOD #468, the laboratory's mission was to provide the Raytheon Manufacturing Company of Waltham, Massachusetts, with facilities for research and development of radar, missile guidance systems, and related equipment.

By the mid-1950's, when most of the construction was done, NIRAP had approximately 98,000 square feet of usable floor space, with another 53,000 square feet taken up by guard houses and test shelters. The Components Laboratory complex had been added to the north of the existing hangar, plating lab, and other original buildings rented from Raytheon.

Flight test facilities were added in 1959. That same year, the Air Force issued NWIRP Bedford a permit to use 5.62 acres of its land. In 1967, the Air Force ceded another 0.85 acre, and on March 11, 1977, the Air Force transferred 36.65 more acres to the Navy.

Buildings constructed during the past 25 years were built largely to support NWIRP Bedford's main mission. These buildings include large facility storage and government buildings near the activity's northern boundary, an Antenna Range between them, air-conditioning and incineration facilities, and the Advanced Medium Range Air-to-Air Missile Development (AMRAD) Building.

4.3.1 Historical Sites. No sites of historical significance are known to exist at NWIRP Bedford.

4.4 LEGAL ACTIONS. Although NWIRP Bedford has not been named in any suit concerning environmental damages, a "John Doe" suit was filed by the Town of Bedford in the summer of 1984. The suit alleges damages to the town's Hartwell Road public water supply well field, the three wells in which were closed down due to solvent contamination of the ground water by 1984. These wells were installed by the Town and put on line in March of 1983. NWIRP Bedford (as well as the privately owned Raytheon Corporation facilities and Hanscom Air Force Base) is located very close to this well field and should follow the progress of this suit closely.

4.5 BIOLOGICAL FEATURES.

4.5.1 Ecosystems. Essentially no natural undisturbed habitat exists on NWIRP Bedford, since the construction of buildings, roads, and parking areas has affected most of the activity. Only a narrow perimeter zone that extends beyond the activity's security fences contains any semblance of a natural environment. The area to the northeast of the Components Laboratory is immature woodland while the area east of the Lark Building consists of mixed immature woodland and scrub/shrub habitat; the latter area also includes a small wetland area of palustrine forested and scrub/shrub habitat.

Due to the intensity of development within the security fences at NWIRP Bedford, the only wildlife that might be found on the activity are those species that adapt well to urbanized environments. The raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), Norway rat (*Rattus norvegicus*), and cottontail rabbit (genus *Sylvilagus*) are examples of mammals that might be found on the activity. Likewise, bird species that frequent developed habitats, such as sparrows, (genus *Passer*), starlings (*Sturnus vulgaris*), and mourning doves (*Zenaidura macroura carolinensis*), might also be regular visitors.

The wildlife that would likely occur within the narrow zone of natural habitat on Navy property is probably more diverse than that within the security fences. However, the differences are not expected to be significant since the general area is developed for residential and office/manufacturing/research and development uses. No significant habitat for any special biological resources exists on Navy property.

Elm Brook (which flows within 600 feet of the activity) and the surrounding swampy area to the north and east of the activity comprise significant biological habitats. Elm Brook flows year round, although during the dry summer months flow is reduced to little more than a trickle. Because of the limited size of Elm Brook, there is no permanent fish population.

Organisms associated with the brook and adjacent swampy areas include aquatic insects, frogs (order Salientia), salamanders (order Caudata), crayfish (genus Cambarus), turtles (order Testudinata), snakes (suborder Serpentes), and small fish, which live near the confluence of Elm Brook and the Shawsheen River. Species of heron and bittern (family Ardeidae), duck (family Anatidae), sandpiper and whimbrel (family Scolopacidae), and plover (family Charadriidae) seasonally occupy the swamp and Elm Brook. Red-winged blackbirds (*Agelaius phoeniceus*) are common in the swamp. Benthic organisms include species of leeches (class Hirudinea) and bacteria; some types of algae also occur in the swamp and the brook.

Elm Brook flows into the Shawsheen River roughly 1.4 miles from NWIRP Bedford. Organisms of the river ecosystem include waterfowl and shore birds, amphibians, reptiles, insects and other arthropods, and fish. Sport fishing is popular in the river, and species regularly taken for human consumption include trout (family Salmonidae) and smallmouth bass (*Micropterus dolomieu*).

All the organisms mentioned above must be considered potential receptors of any contaminants which may migrate from NWIRP Bedford. The fact that sport fishermen may catch and eat contaminated fish requires that humans also be viewed as potential receptors of pollutants which may emanate from NWIRP Bedford.

4.5.2 Endangered, Threatened, and Rare Species. Endangered and threatened species are animals or plants whose populations have dwindled or whose native habitat has been reduced. The Federal government has developed a list of endangered and threatened wildlife and plant species (Federal

Register, July 27, 1983) that have been designated by the Department of Interior to receive protection under the Endangered Species Act of 1973 (Federal Register, 1979).

In consultation with the Massachusetts Natural Heritage Program, it has been determined that no rare plant or animal species populations or ecologically significant natural communities have been found to occur on Navy property at NWIRP Bedford.

Although not reported as occurring within the boundaries of NWIRP Bedford, several species of rare plants and wildlife do occur within the surrounding region. The plants Britton's violet (Viola brittoniana) and round fruited false strife (Ludwigia sphaerocarpa), which are designated "threatened"; the birds least bittern (Ixobychus exilis) and king rail (Rallus elegans), also designated "threatened"; and the birds American bittern (Votaurus lentiginosus) and common moorhen (Gallinula chloropus), designated "special concern," are found in riverine wetland marshes within the nearby Great Meadows National Wildlife Refuge. The upland sandpiper (Bartramia longicauda), designated "endangered," and the grasshopper sparrow (Ammodramus savannarum), designated "special concern," are grassland birds that have been sighted at Hanscom Air Force Base but that are not found in the less open areas at NWIRP Bedford.

4.6 PHYSICAL FEATURES.

4.6.1 Climatology. NWIRP Bedford is located about 25 miles west of the Atlantic Ocean, which has a moderating effect on extreme temperatures. Normal minimum and maximum daily temperatures in the area range from 23 degrees F. in February to 82 degrees F. in July. Extreme temperatures on record for the area are -18 degrees F. and 104 degrees F. Normal annual total precipitation at NWIRP Bedford is 44 inches. Precipitation is fairly evenly distributed throughout the year (National Oceanic and Atmospheric Administration (NOAA), 1979).

The prevailing wind direction at NWIRP Bedford is westerly. The mean annual wind speed and direction for the Boston area is approximately 15 miles per hour out of the west (NOAA, 1979). Climatological data collected at Hanscom Air Force Base is included in Table 4-1. Hanscom Field is immediately adjacent to the southern portion of NWIRP Bedford.

4.6.2 Topography. NWIRP Bedford lies in the Eastern Plateau physiographic province of eastern Massachusetts. This province is characterized by low-lying, poorly drained glacial deposits. Wetlands are common throughout the region. These wetlands tend to occur where coarse-grained glacial deposits abut much finer-grained glacial till. Prior to the construction of NWIRP Bedford, the area, with the exception of Hartwell's Hill, on which the activity is built, was a swamp. During construction, the wetlands were filled. Figure 4-1 presents the U.S. Geological Survey (USGS) topographic map of NWIRP Bedford and its environs.

Table 4-1

Climatological Data, Vicinity of NWIRP Bedford, Massachusetts

	Temperature (^{o}F)				Precipitation (inches)	
Month	Mean Daily Max.	Mean Daily Min.	Highest	Lowest	Mean Total	Snow Fall
January	35	17	71	-21	3.98	16.7
February	37	18	69	-23	3.25	14.6
March	45	27	85	-9	4.11	11.9
April	57	36	89	14	4.01	2.4
May	69	46	95	28	3.89	0
June	78	55	99	34	2.88	0
July	83	60	101	38	3.04	0
August	81	58	103	40	3.93	0
September	74	51	101	28	3.44	0
October	64	41	89	18	3.15	.2
November	51	32	85	10	4.59	1.0
December	39	20	65	-11	3.79	10.7
Annual	60	39	103	-23	43.97	56.60

Source: U.S. Geological Survey

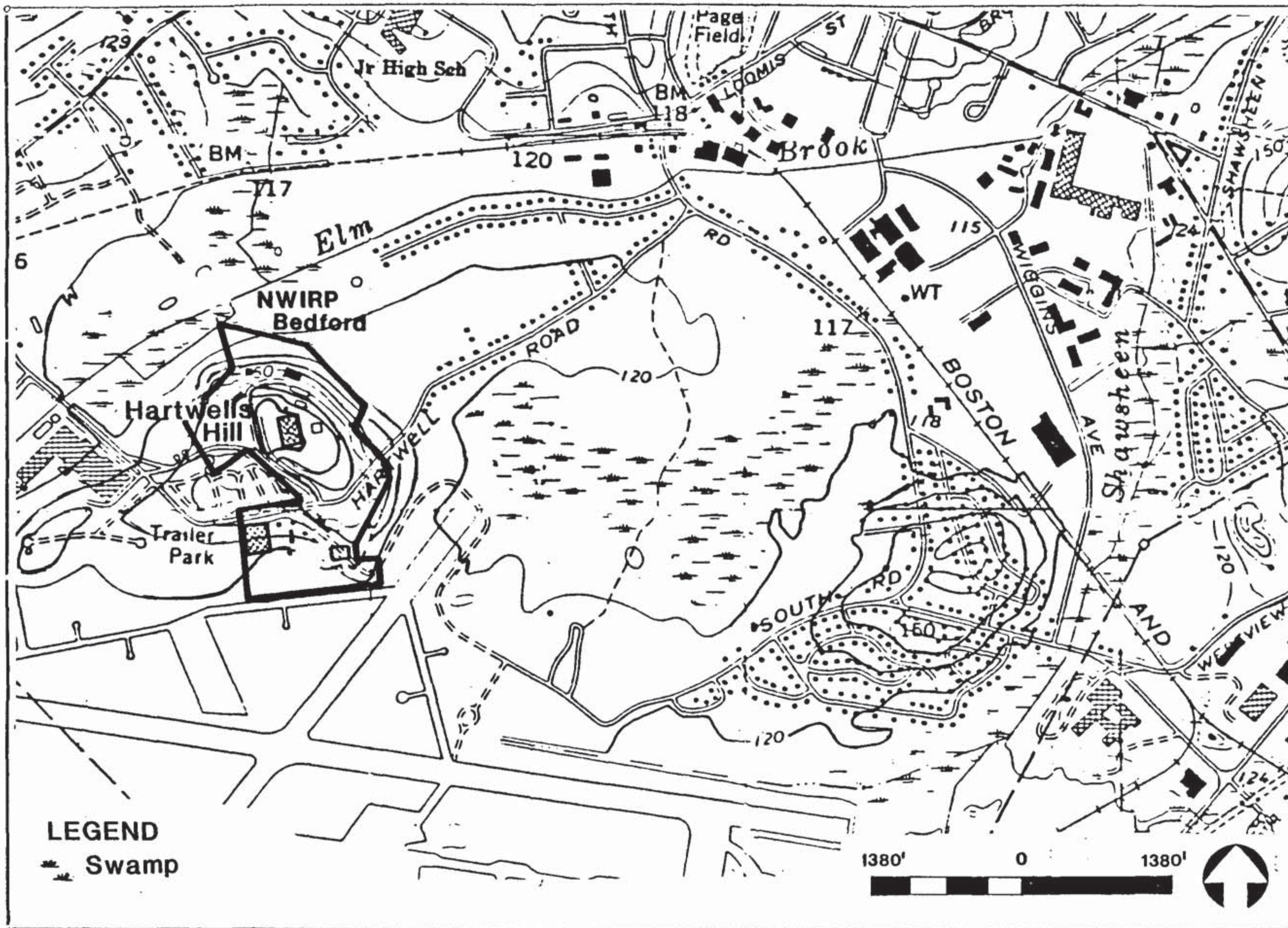

Figure 4-1

U.S. Geological Survey
Topographic Map of NWIRP
Bedford, Massachusetts

Initial Assessment Study
Naval Weapons
Industrial Reserve Plant
Bedford, Massachusetts

The elevation at NWIRP Bedford ranges between approximately 127 and 205 feet above mean sea level (MSL). The lowest portion of the activity occurs at its southernmost extent, immediately adjacent to Hanscom Field.

4.6.3 **Geology**. NWIRP Bedford rests on Hartwell's Hill, a bedrock knob of Ordovician-age Salem Gabbro diorite that is overlain by Pleistocene-age glacial deposits. The glacial deposits (tills) range in thickness from 10 to 40 feet. Because of repeated periods of glaciation during the last 200,000 years, any pre-existing sedimentary rock that may have lain beneath NWIRP Bedford is gone; glacial deposits and diorite bedrock alone underlie the activity (Figure 4-2).

During one of the more recent (Pleistocene) periods of glacial retreat, the region surrounding Hartwell's Hill was covered by glacial melt waters; Hartwell's Hill itself rose above the water level, however. The glacial melt waters ponded in this area are known as Lake Concord (USGS, 1964). Glacio-lacustrine sediments consisting of silts and clays floculated and settled from Lake Concord, creating an apron of fine-grained sediments surrounding Hartwell's Hill.

In recent times, the glacial till and lacustrine silts and clays have given rise to area soils. Because the underlying tills and lacustrine sediments are highly impermeable, depressions in which soils formed are, and have been, poorly drained. Thus, soils have formed under wet reducing conditions, and are characteristically rich in organic components.

4.6.3.1 Description of Stratigraphic Units. The following sections describe each member of the stratigraphic sequence underlying NWIRP Bedford in greater detail. The descriptions are based on information gathered from several recent hydrogeologic investigations in the immediate area of the activity (CDM, 1984; Weston, 1984; JRB, 1984). The geologic units are discussed in order of increasing age.

4.6.3.1.1 Fill Material. Fill material was used during construction of NWIRP Bedford to fill in the wetlands and swamps around Hartwell's Hill. The fill material consisted primarily of local sand and silt. Between 3 and 7 feet of fill material was used in the low-lying area of the Flight Test Facility.

4.6.3.1.2 Swamp Deposits. Swamp deposits consisting of organic materials and small quantities of sand (probably originating in the glacial till that characteristically underlies these paludal deposits) were identified in several borings in the area (Weston, 1983, 1984; Camp, Dresser and McKee (CDM), 1984). This is the material upon which the fill was placed. These deposits consist primarily of peat and loam, range up to 7 feet in tickness, and are of recent origin. Water table levels are typically near Drainage is poor to very poor (USDA, 1982).

Swamp deposits okccurring on NWIRP Bedford are comprised of three distrinct soil types. These are the Swansea muck, the Scarboro muck, and the Freetown muck. A discussion of these seamp-soil deposits is found in section 4.6.4.

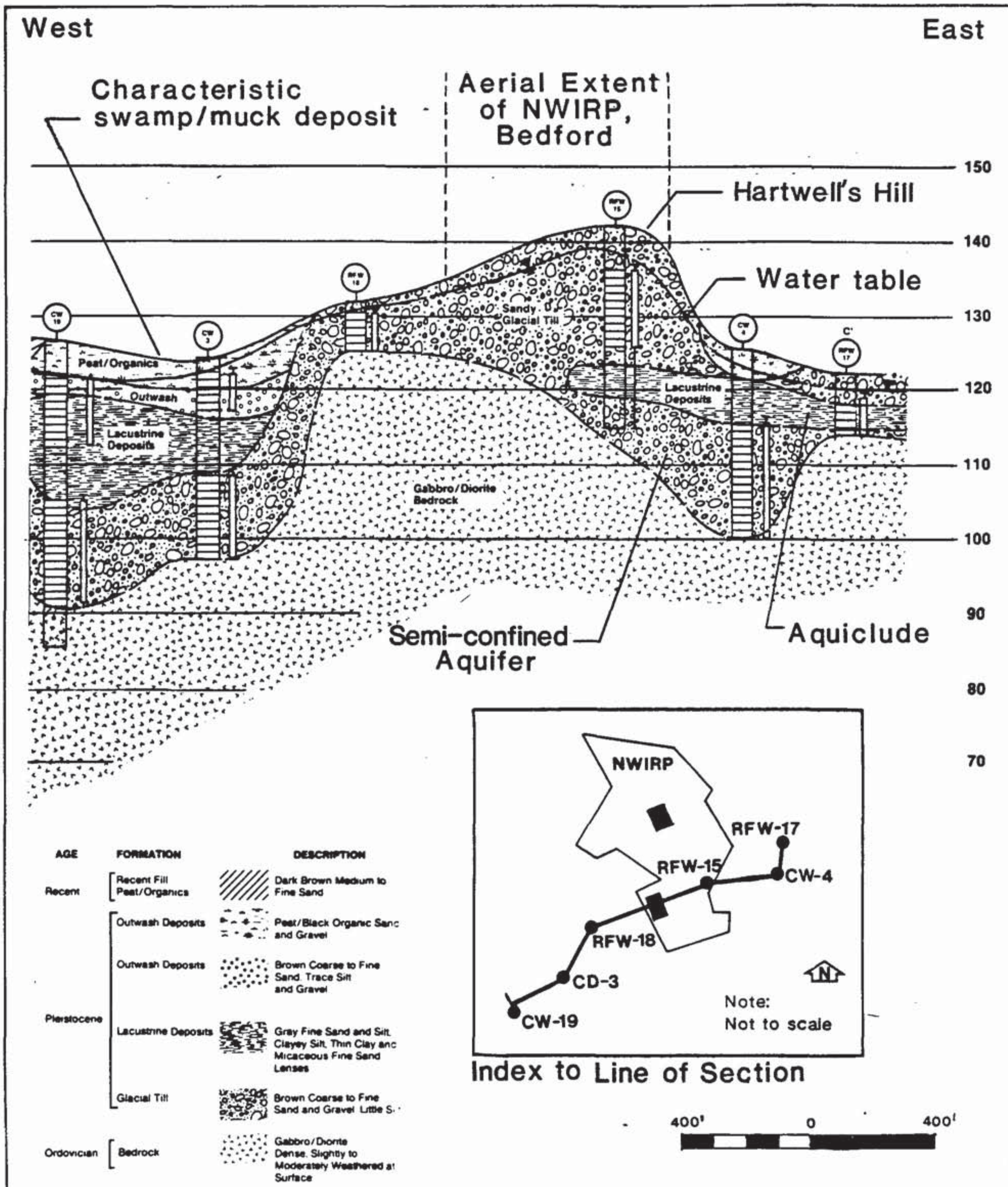

Figure 4-2

Geologic Cross Section, NWIRP Bedford, Massachusetts

Initial Assessment Study
Naval Weapons
Industrial Reserve Plant
Bedford, Massachusetts

4.6.3.1.3 Glacial Lacustrine Deposits. This geologic unit consits of a 10- to 60-foot-thick sequence of horizontally laminated, fine, silty sand layers and silty clay layers, deposited from Pleistocene Lake Concord. This unit is absent on Hartwell's Hill, which rose above the level of Lake Concord; the unit does appear around the base of Hartwell Hill. The saturated, fine-grained deposits act as an aquitard to the vertical movement of ground water; hydraulic conductivities of the lacustrine deposits are 10 to the minus 11 meters/second.

4.6.3.1.4 Glacial Till. Immediately overlying the bedrock in this area is a layer of sandy glacial till. The nonstratified deposits are generally coarse-grained, permeable, and saturated. The till layer mimics the bedrock surface, and ranges from 10 to 40 feet in thickness. Hydraulic conductivity varies considerably from 10 to the minus 6 to 10 to the minus 12 meters/second, depending on clay content.

4.6.3.1.5 Bedrock. This geologic unit consists of a dioritic to granitic rock of Ordovician age. Close to the till-diorite interface, the diorite bedrock has a high capacity to store water (CDM, 1984). Bedrock is highly fractured at the interface (CDM, 1984), accounting for the high storage capacity; the hydraulic conductivity of the bedrock is 10 to the minus 8 to 10 to the minus 9 meters/second (Freeze and Cherry, 1979). However, the bedrock becomes increasingly dense at deeper levels, and water storage capacity approaches zero.

The surface geology of the NWIRP Bedford area is shown in Figure 4-3.

4.6.4 <u>Soils</u>. The US Department of Agriculture has classified the soils at NWIRP Bedford (USDA, 1982). Soils occurring on the activity include the Swansea (units #45 and 69), Scarboro (unit #40), and Freetown mucks (unit #46), the Whitman fine sandy loam (units #30, 33, and 34), the Windsor loamy sand (unit #67), the Deerfield loamy sand (unit #138), and the Pipestone loamy sand (unit #391). Madeland (#52), consisting of areas from which soil has been excavated and deposited, constitutes a large fraction of the land at NWIRP Bedford. Figure 4-4 shows the major soil types that underlie the activity.

Deerfield soils are moderately well drained and occur on glacial outwash plains. They have a seasonal high water table at 18 to 36 inches below the surface. Limitations are related to wetness. Permeability is rapid, shrink-swell potential is low.

Pipestone soils are deep, poorly drained soils that occur on former glacial outwash plains. High water tables are 6 to 18 inches below the surface. Limitations are related to wetness; shrink-swell potential is low.

Windsor soils are deep, excessivly drained, and occur in glacial outwash deposits. Permeability is rapid and shrink-swell capacity is low.

Whitman soils are deep and poorly drained; they occur on glacial outwash. Permeability is rapid, and there is a high water table at 6 to 18 inches. Limitations are related to wetness, and shrink-swell capacity is low.

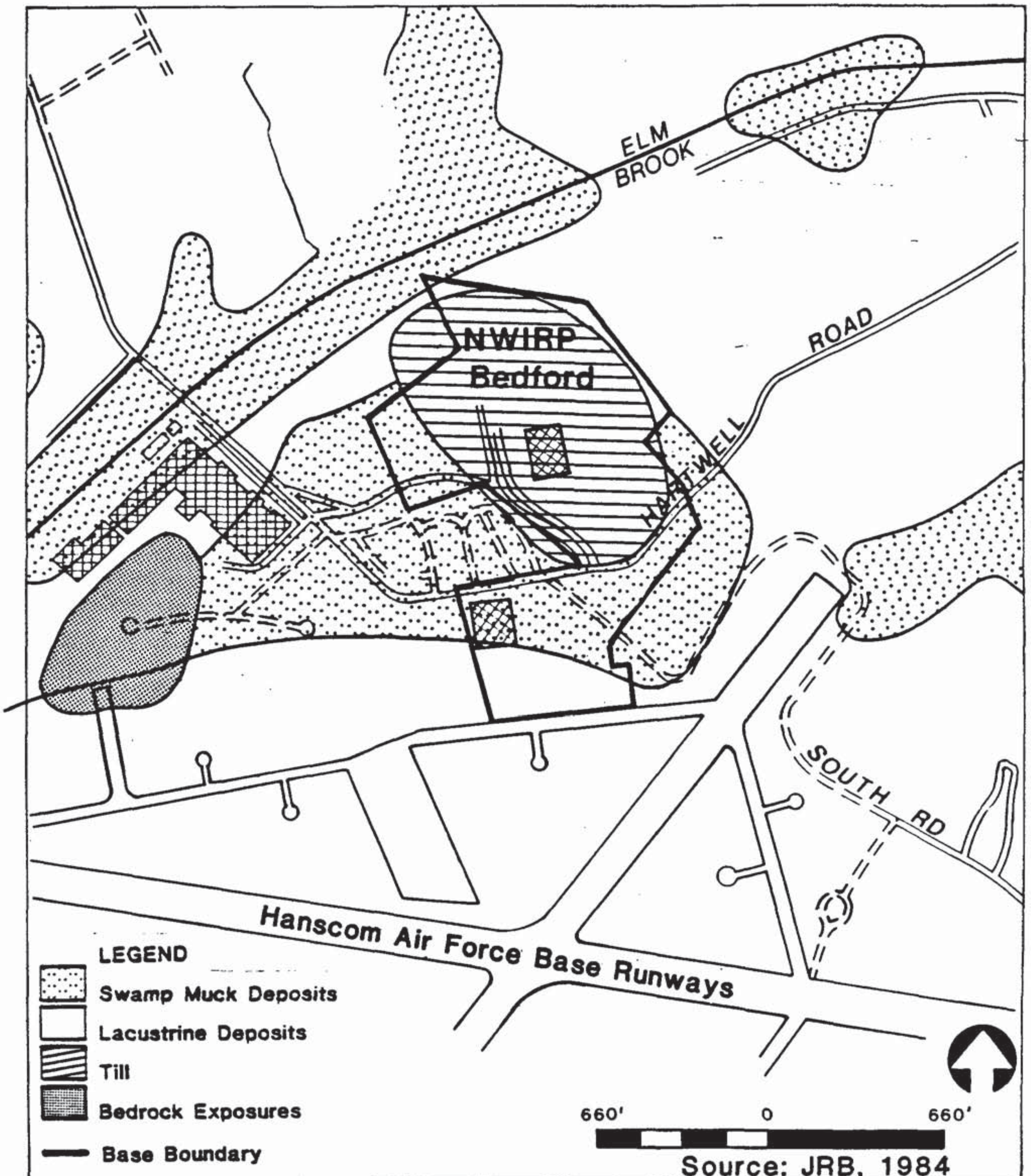

Figure 4-3

Surface Geology,
NWIRP Bedford,
Massachusetts

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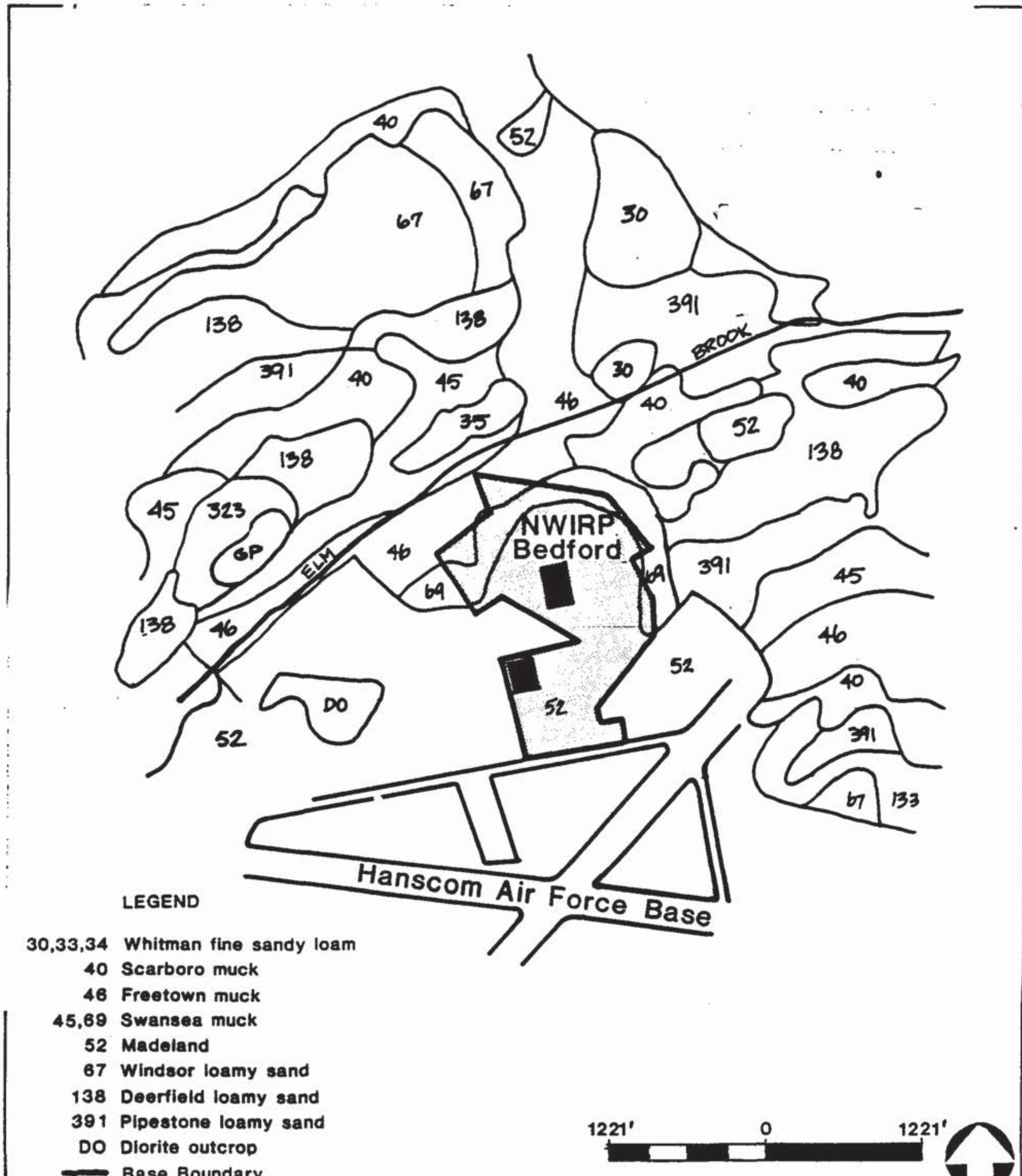

Figure 4-4

Soils in the Vicinity of NWIRP Bedford, Massachusetts

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Swansea muck is a deep, poorly drained organic soil that forms in glacial outwash plains in black, decomposed organic matter (muck). Permeability is low, although sandy material underneath may have a high permeability. The water table is near the surface most of the year, and shrink-swell potential is low.

Scarboro muck is deep and poorly drained. It forms atop sandy glacial outwash that is 3 to 16 inches from the soil surface. Permeability is very rapid. Shrink-swell potential is slow. The water table is near the surface.

Freetown mucky soils are deep, poorly drained organic soils that form over glacial outwash in organic matter that in the case was 51 inches to many feet deep. Permeability is moderate to rapid, and the water table is near the surface. Shrink-swell potential is low.

4.6.5 Surface Water. NWIRP Bedford is located near the headwaters of the Shawsheen River. Elm Brook, a tributary to the Shawsheen, drains the swampy area surrounding NWIRP Bedford. Storm water culverts provide surface drainage for the activity; the storm water culverts empty into the swamp. Elm Brook originates in a swampy area to the southwest of the activity and joins the Shawsheen River approximately 1.2 miles northeast of NWIRP Bedford. At the closest point, Elm Brook passes within 600 feet of NWIRP Bedford. Figure 4-5 shows surface water drainage characteristics in the vicinity of NWIRP Bedford.

Surface runoff in the headwaters of the Shawsheen River varies considerably with the season. The trend is low winter flows followed by heavy spring runoff, which generally recedes rapidly in June (Motts and O'Brien, 1981). Daily runoff per square mile of drainage area in the Shawsheen River drainage basin ranges from a maximum of 0.17 inches to a minimum of 0.0043 inches, with an annual average of 17.24 inches (Motts and O'Brien, 1981).

Sustained low flow in the Shawsheen River is probably supported by ground water discharge from shallow unconfined aquifers which are fed by the surrounding swamps and lowlands. Flow data taken in the Shawsheen River approximately 7.5 miles downstream from NWIRP Bedford indicate that only small quantities of water are stored in, and discharged from, aquifers to maintain stream flow (Motts and O'Brien, 1981).

Much of the variation in flow of the Shawsheen River is caused by the fact that this river is the main collector of storm runoff in the area. The heavy runoff is a result of the extensive paved areas of Hanscom Field and Hanscom Air Force Base, which lie immediately to the south of NWIRP Bedford. The normal range in flow depth of the river is approximately 2 to 3 feet when the river reaches flood stage in early spring at the downstream towns of Bedford, Billerica, and Tewksbury. The Shawsheen has been reported to reach flow depths of 5 to 6 feet at Hanscom Air Force Base, but no major flood damage has occurred in the area of NWIRP Bedford because the activity is located in the upper reaches of the drainage basin.

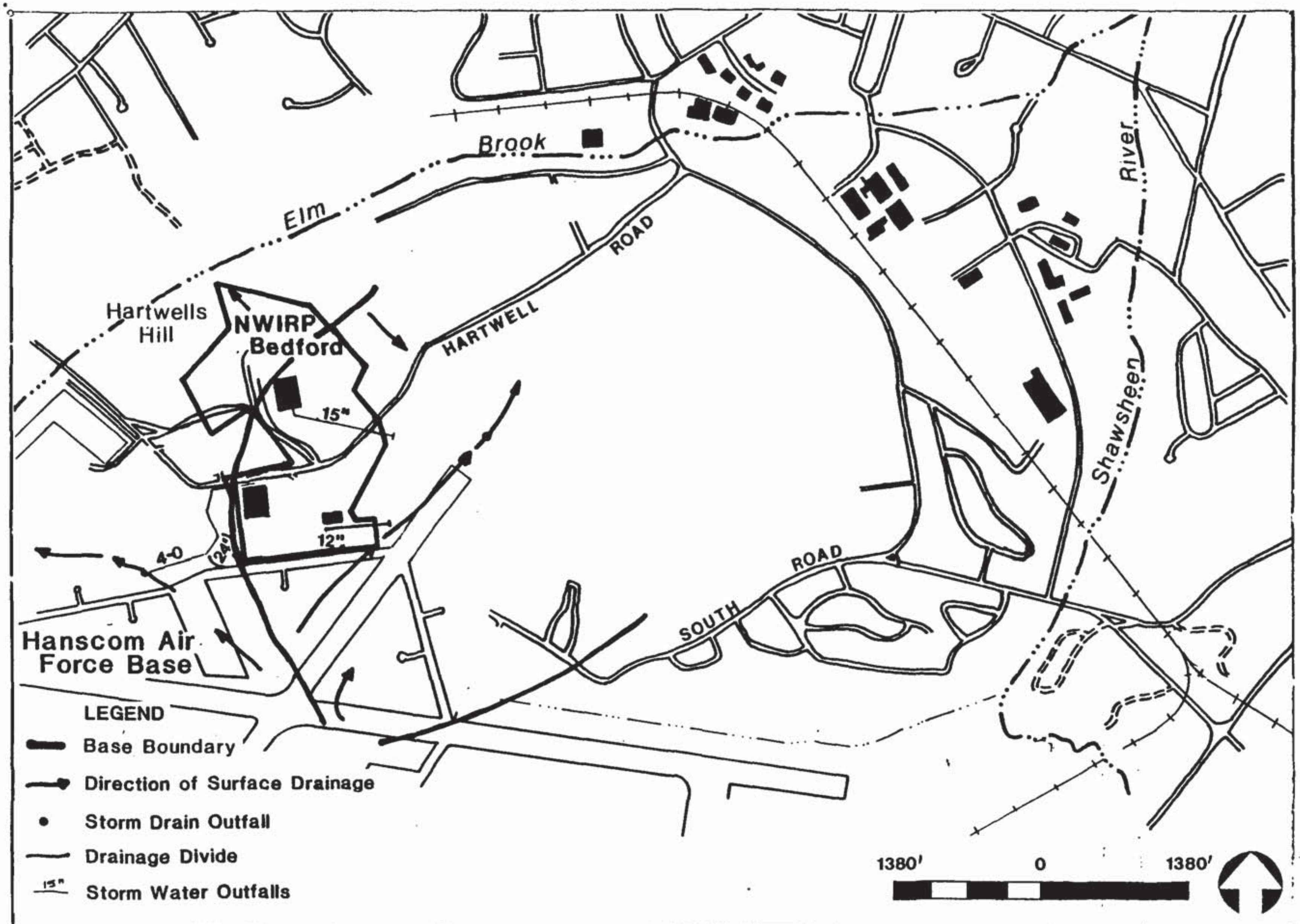

Figure 4-5

Drainage Features, NWIRP Bedford, Massachusetts

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Three storm water outfalls drain the Navy-owned property at NWIRP Bedford. One 24-inch line drains the Flight Test Facility area and discharges into Elm Brook (Figure 4-5). This storm drain is covered by a 1971 National Pollutant Discharge Elimination System (NPDES) permit which allows 19,600 gallons per day to be discharged. Measurements made in 1975 showed a maximum discharge from this outfall of 3,000 gallons per day. An oil/water separator is installed on this storm drain.

The second storm water line (15 inches in diameter) drains the foundation of the Components Laboratory and discharges onto a wooded slope on the south side of Hartwell Road just outside Navy-owned property.

The third storm drain (a 12-inch storm drain) originates at the southwest corner of the Old Hangar. It discharges rainwater runoff into the swampy area to the east of the Old Hangar.

4.6.6. **Surface Water Quality.** Several recent studies have examined the water quality of Elm Brook and the storm water outfalls in the vicinity of NWIRP Bedford (Weston, 1984; CDM, 1984). Data on the water quality of Elm Brook downstream from NWIRP Bedford indicate no contamination from volatile organic chemicals. One sample from the 24-inch storm water outfall which drains the Flight Test Facility area showed methylene chloride, attributed to contamination at the analytical laboratory which tested the sample (Weston, 1984). Discharge from the 15-inch line that drains the Components Laboratory area has not been analyzed to date.

4.6.7 **Ground Water.** Ground water at NWIRP Bedford is found under two conditions: as slow-moving interstitial water in the lacustrine and swamp deposits and as ground water in the glacial till and bedrock. The surface topography and surface hydrology have the greatest influence on ground water flow in the soils and in the immediately underlying glacial tills on Hartwell's Hill. As stated, Hartwell's Hill is a bedrock knob covered with 10 to 40 feet of glacial till. Ground water migration from the hill through the till is largely directed by topography; this is the case because till is an unsorted, unstratified, essentially homogeneous deposit lacking in continuous structures that can significantly redirect ground water flow directions.

Besides topography, surface hydrology creates hydraulic gradients that influence shallow ground water migration. Elm Brook and the Shawsheen River are located to the north and east of the activity. Water in the swamp area to the north and east of the activity is induced to migrate toward these discharge areas. Moreover, ground water from the till slowly discharges into these rivers.

Thus, the ground water flow direction at Hartwell's Hill is primarily east and north toward the Shawsheen River and Elm Brook, with flow directions determined by topography and surface drainage patterns. Because the swamp areas are flat and saturated, hydraulic gradients in the swamp are generally low, and are low to nonexistent in the parts of the swamp farthest from the streams.

The sandy glacial till material that blankets the bedrock underlying NWIRP Bedford exists under saturated conditions. Where overlain by lacustrine or swamp deposits (around the base of Hartwell's Hill), the till aquifer may exhibit piezometric heads up to 1 foot higher than nearby unconfined units (Weston, 1984). In areas where the till is not overlain by the lacustrine material, the ground water in the till is unconfined. Hydraulic conductivities in the till range from 10 to the minus 6 to 10 to the minus 12 meters/second.

Hydraulic conductivity of the fractured bedrock at the till/bedrock interface is 10 to the minus 8 meters/second (Weston, 1984; Freeze and Cherry, 1979). Deeper, unfractured bedrock is impermeable. The relief of the bedrock surface has the greatest influence on the ground water flow in the deepest layers of the till that directly overlie the bedrock. Data on bedrock topography collected by JRB Associates indicate that ground water immediately above bedrock at NWIRP Bedford must migrate east, and discharge into the Shawsheen River (JRB Associates, 1984).

Ground water in soils and in shallow till migrates east and north from Hartwell's Hill. Migration direction is influenced primarily by the topographic expression of the hill; to a lesser degree, direction is determined by the surface water drainage patterns. Migration is slow due to low conductivities and low topographic gradients. The generally poor drainage of the area has probably been a major factor in the generation of the mucky, peaty soils that predominate around NWIRP Bedford. Figures 4-5 and 4-6 show surface drainage and ground water migration patterns, respectively.

4.6.8 __Ground Water Quality__. The quality of ground water in the area of NWIRP Bedford has recently been the object of scrutiny, due to contamination of the Bedford municipal wells at the Hartwell Road Well Field. The well field is located several hundred feet north and west of NWIRP Bedford, on the north side of Elm Brook. It is unlikely that contaminants from the activity entered the wells, because Elm Brook is the locus of ground water discharge and thereby serves as a hydraulic barrier.

By early 1984, volatile organic chemicals and dissolved iron had reached unacceptable concentrations, and the well field ceased production. A series of three hydrogeologic investigations implemented by the Air Force resulted in the following conclusions:

- o At least three sources of ground water contamination exist at Hanscom Field.
- o The Hartwell Road Well Field is not likely to be affected by contaminants released from Hanscom Field sources (Weston, 1983; Weston, 1984; JRB Associates, 1984).

These investigations concluded that the structure of the bedrock surface precluded significant ground water migration from the area of Hanscom Field to the Hartwell Road Well Field (although there are three limited ground

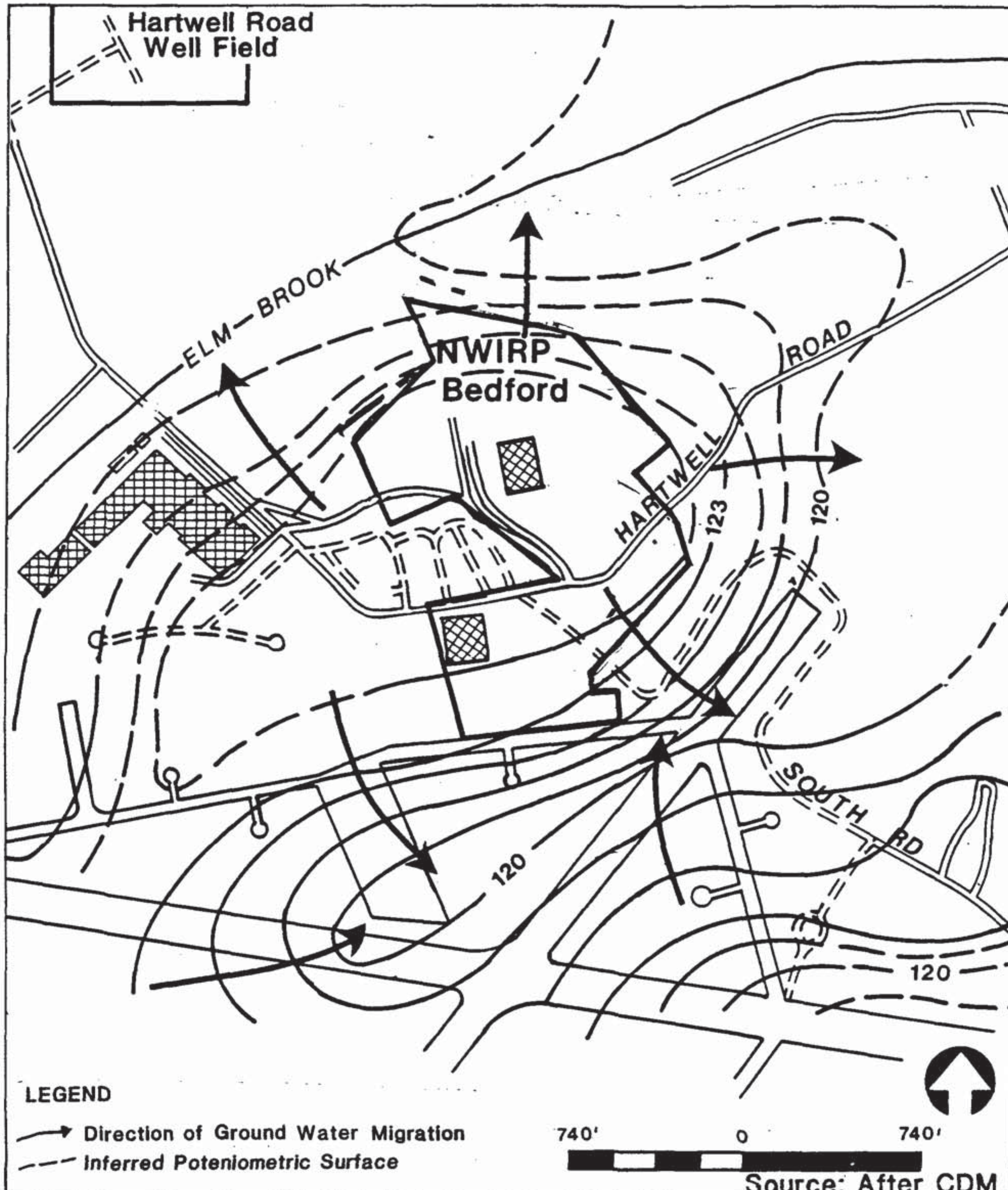

Figure 4-6

Ground Water Migration Map, NWIRP Bedford, Massachusetts

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water migration pathways, as shown in Figure 4-6). The same information indicates that contaminant migration from the Navy-owned property at NWIRP Bedford to the well field is unlikely. A subsequent report by BSC Engineering, prepared for Raytheon Missile Division, provided additional evidence in support of these conclusions (BSC Engineering, 1985).

4.7 MIGRATION POTENTIAL. Migration pathways at NWIRP Bedford include ground water transport in the sandy glacial till, over the bedrock surface, and via surface and storm water runoff to Elm Brook or the Shawsheen River.

4.7.1 Ground Water Migration Potential. The geology of NWIRP Bedford creates an environment of low ground water migration potential. Specifically, the low migration potential is determined by low hydraulic conductivities of the locally occurring glacial deposits; by the flatness of the swamps surrounding the activity; and by the very poor drainage in swampy areas and in the underlying glacial deposits.

Ground water beneath NWIRP Bedford is not affected by the cone of influence of any producing well (JRB, 1984).

4.7.2 Surface Water Migration Potential. NWIRP Bedford lies in the drainage basin of the Shawsheen River. It is not likely that runoff from the activity directly enters the Shawsheen River, or Elm Brook, since swampy areas surrounding the activity greatly retard liquid movement.

Downstream from NWIRP Bedford (1.4 miles), the Shawsheen River meets Massachusetts Department of Environmental Quality Engineering water quality standards for a Class B (fishable/swimmable) stream.

The water in Elm Brook is not used as a source of potable or agricultural water. The Shawsheen River is not used as a source of agricultural water; however, the town of Burlington indirectly uses the Shawsheen as a source of potable water. The town pumps water from the Shawsheen into the Mill Pond Reservoir, approximately 10 miles downstream from NWIRP Bedford. Water from the reservoir is physically and chemically treated before being used.

CHAPTER 5. WASTE GENERATION

5.1 GENERAL. Waste generation at NWIRP Bedford, Massachusetts, has resulted from laboratory research, electroplating operations, and vehicle and aircraft maintenance. The Plant Engineering Department serves as overall coordinator of waste management at the activity. The Stores Department is responsible for the movement and temporary storage of hazardous wastes.

5.2 NWIRP BEDFORD. Section 5.2 chronologically describes waste generation by waste type (e.g., hazardous waste, aqueous waste, etc.) for NWIRP Bedford. A shop-by shop account of waste type, quantity, and disposal follows in subsequent sections. All information is summarized in Table 5-1.

All hazardous wastes generated by NWIRP Bedford have been managed in a similar fashion. With few exceptions, hazardous wastes have either been discarded into the sanitary sewer or have been stored temporarily prior to removal off-activity by a private contractor. From 1953, when NWIRP Bedford was established, until the late 1960's, all concentrated wastes were placed into barrels and stored in or near the lab or shop of origin until they were picked up by private contractors.

From the late 1960's until 1981, wastes from the north end of the activity were taken to the Old Barrel Storage Area (near the Government Building) for storage. Petroleum, oils, and lubricants (POL's) were stored in an underground 2,000-gallon tank located in this area, while waste solvents and concentrated or highly toxic aqueous solutions were stored in barrels prior to removal off-activity. In 1977, use of the underground tank was discontinued and all wastes from the north end of the activity, including POL's, were stored in barrels. In 1981, however, the Hazardous Waste Storage Shed was constructed, and since that time all wastes from the north end of NWIRP Bedford have been taken to this shed for temporary storage prior to off-activity disposal by contractors.

Waste POL's from the south end of the activity were taken to one of two underground waste oil tanks located just outside the NWIRP Bedford boundary for temporary storage before contractor removal. One tank, near the Flight Test Facility, was used from 1954 until 1977, when use of it was discontinued. The other tank, an old underground aviation fuel tank near the Old Hangar, was recently discovered to contain waste oils. Waste solvents were stored at the tank near the Flight Test Facility until use of this tank was discontinued in 1977. After 1977, waste solvents were taken to the Plating Laboratory Storage Area to await off-activity removal by contractors. Concentrated aqueous wastes from the Plating Laboratory were always stored in the same area prior to off-activity removal by contractors.

Dilute aqueous wastes from both the north and south sides of the activity have been directed to the sanitary sewer for treatment off-activity. Some of these wastes are pretreated prior to disposal.

Between the late 1970's and 1981 waste solvents from Raytheon's Systems Laboratory were carried to the Old Barrel Storage Area to await off-activity disposal.

Table 5-1

Waste Generation Rates and Total Wastes Generated at NWIRP Bedford, 1954-1985

Source and Waste Type	Period of Generation	Waste Generation Rate (Gallons* Per Year)	Total Waste (Thousands of Gallons*)	Treatment or Disposal Method
Photo Lab				
Dupont DFL fixer	1961-present	1200	29	Sanitary sewer (silver recovery)
EP-2 fixer	1961-1979	1200	29	Sanitary sewer
E-6 fixer	1979-present	1000	24	Sanitary sewer
E-6 bleach	1979-present	1200	29	Sanitary sewer
C-41 bleach	1977-present	400	10	Sanitary sewer
Acetic acid	1961-present	1	0.02	Sanitary sewer
Sodium hydroxide	1961-present	1	0.02	Sanitary sewer
Sulfuric acid	1961-present	1	0.02	Sanitary sewer
Potassium hydroxide	1961-present	1	0.02	Sanitary sewer
Ammonium hydroxide	1961-present	1	0.02	Sanitary sewer
Trichloroethylene	1954-1980	660	67	Hazardous waste contract disposal
Machine Shop				
1,1,1-trichloroethane	1980-present	660	3	Hazardous waste contract disposal
Cutting oils and coolants	1954-present	2600	81	Contract disposal
Hydraulic waste oils	1954-present	40	1.2	Contract disposal
Flammable solvents (Stoddard solvent)	1954-present	660	20	Contract disposal
Paint Spray Shop				
Lacquer thinner	1954-present	60	2	Contract disposal
Toluene	1954-present	36	1	Hazardous waste contract disposal
Xylene	1954-present	12	.4	Contract disposal
Residual waste paint	1955-1973	¼115	¼2070	Old Incinerator
Residual waste paint	1974-present	¼115	¼1265	Contract disposal

* Unless otherwise noted.

Table 5-1 (contd.)

Waste Generation Rates and Total Wastes Generated
at NWIRP Bedford, 1954-1985

Source and Waste Type	Period of Generation	Waste Generation Rate (Gallons* per Year)	Total Waste (Thousands of Gallons*)	Treatment or Disposal Method
Paint Spray Shop (contd.)				
Alcohol	1954-present	12	.4	Contract disposal
Acetone	1954-present	.5	.02	Contract disposal
AMRAD Building				
Mixed office waste	1962-1973	undetermined	undetermined	Old incinerator
Mixed office waste	1974-1979	undetermined	undetermined	Contract disposal
Mixed office waste	1979-present	undetermined	undetermined	New incinerator
Engineering Analysis and Testing Department				
Waste oil	1954-present	60	2	Contract disposal
Acetone	1954-present	30	1	Contract disposal
Alcohol	1954-present	30	1	Contract disposal
Hydraulic oil	1954-present	30	1	Contract disposal
Freon	1954-present	30	1	Contract disposal
Metallurgical and Device Analysis Laboratory				
Propanol	1954-present	24	.7	Contract disposal
Acetone	1954-present	12	.4	Contract disposal
Methanol	1954-present	6	.2	Contract disposal
Trichloroethylene	1954-present	6	.2	Hazardous waste contract disposal
Methyl ethyl ketone	1954-present	2	.06	Hazardous waste contract disposal
Ethylene glycol	1954-present	6	.2	Contract disposal
Sulfuric acid	1954-present	6	.2	Contract disposal
Nitric acid	1954-present	6	.2	Contract disposal
Hydrochloric acid	1954-present	6	.2	Contract disposal
Hydrofluoric acid	1954-present	6	.2	Contract disposal
Phosphoric acid	1954-present	6	.2	Contract disposal

* Unless otherwise noted.

Table 5-1 (contd.)

Waste Generation Rates and Total Wastes Generated
at NWIRP Bedford, 1954-1985

Source and Waste Type	Period of Generation	Waste Generation Rate (Gallons* per Year)	Total Waste (Thousands of Gallons*)	Treatment or Disposal Method
Chromate Laboratory				
Nitric acid	1975-present	200*	.2	Contract disposal
Rinsewater (concentrated)	1975-1984	1,800	14	Contract disposal
Rinsewater (neutralized)	1984-present	1,800	14	Contract disposal
Acetone	1975-present	100	.1	Contract disposal
Rinsewater (dilute)	1975-present	880,000	8800	Sanitary sewer
Chromic acid	1975-present	200	2	Contract disposal
Printed Circuit Board Etch Facility				
Cupric etch	1965-present	4	.04	Contract disposal (copper recovery)
Photo resist	1965-present	2	.02	Sanitary sewer
Sulfuric acid	1965-present	.12	.0012	Sanitary sewer
Immersion tin	1965-present	.12	.0012	Sanitary sewer
Immersion gold	1965-present	.12	.0012	Sanitary sewer
Electroplate gold	1965-present	.04	.0004	Sanitary sewer
Gold etch	1965-present	.004	.00004	Sanitary sewer
Chrome etch	1965-present	.016	.00016	Sanitary sewer
Shipley developer	1965-present	2	.02	Sanitary sewer
Facility Storage Vehicle Maintenance				
Motor oil	1969-present	330	9	Contract disposal
Facility Storage Print Shop				
Press clean solvent	1981-present	28	.1	Contract disposal
777 Blanketwash	1981-present	33	.1	Hazardous waste contract disposal
(1,1,1-trichloroethane) cyanide wastes	1981-present	100	.4	Hazardous waste contract disposal

* Unless otherwise noted.

Table 5-1 (contd.)

Waste Generation Rates and Total Wastes Generated at NWIRP Bedford, 1954-1985

Source and Waste Type	Period of Generation	Waste Generation Rate (Gallons* per Year)	Total Waste (Thousands of Gallons*)	Treatment or Disposal Method
Paint Shop				
Residual waste paint	1955-1973	¼72	¼1.8	Old Incinerator
Residual waste paint	1974-present	72	1.8	Contract Disposal
Enamel paint	1955-1973	¼72	¼1.8	Old Incinerator
Enamel paint	1974-present	72	1.8	Contract disposal
Turpentine	1955-present	5	.12	Contract disposal
Paint thinner	1955-present	15	.4	Old Incinerator
Lacquer thinner	1955-present	2.5	.05	Old Incinerator
Toluene	1955-present	40	.6	Hazardous waste contract disposal
Shelac	1955-1973	¼15	¼.1	Old Incinerator
Shelac	1974-present	15	.1	Contract disposal
Boiler Maintenance (various locations)				
Dearborn B-269 or equivalent	1954-present	60	1.9	Sanitary sewer
Dearborn B-239 or equivalent	1954-present	240	7.4	Sanitary Sewer
Dearborn B-214 or equivalent	1954-present	220	6.8	Sanitary sewer
Kero clean	1954-present	100	3.1	Contract disposal
Hawk Van Building				
Metal cleaning acids	1955-present	240	7	Contract disposal
Flight Test Facility				
Waste oil	1957-present	220	6	Contract disposal
Antenna Range Building				
Mixed office waste	1954-present	undetermined	undetermined	Contract disposal

* Unless otherwise noted.

Table 5-1 (contd.)

Waste Generation Rates and Total Wastes Generated
at NWIRP Bedford, 1954-1985

Source and Waste Type	Period of Generation	Waste Generation Rate (Gallons* per Year)	Total Waste (Thousands of Gallons*)	Treatment or Disposal Method
Lark Building				
High contrast developer	1954-present	1500	50	Sanitary sewer
Kodak rapid fixer	1954-present	3000	90	Sanitary sewer
PMT developer	1954-present	125	1	Sanitary sewer
INT developer	1954-present	50	1.6	Sanitary sewer
Hand developer	1954-present	50	1.6	Sanitary sewer
Rubber cement thinner	1954-present	.02	.0006	Sanitary sewer
Isopropyl alcohol	1954-present	.02	.0006	Sanitary sewer
Film	1955-1973	<60 pounds	<1080 pounds	Old Incinerator
Film	1974-1979	<60 pounds	<1080 pounds	Contrct disposal
Film	1979-present	60 pounds	1080 pounds	New Incinerator
Microphotographic Laboratory				
Fixer	1967-present	600	5	Sanitary sewer (silver recovery)
B&W developer	1967-present	250	2	Sanitary sewer
Second developer	1967-present	600	5	Sanitary sewer
Ammonium hydroxide	1967-present	150	1	Sanitary sewer
Toner	1967-present	100	.8	Contract disposal
Dupont & Fuji developers	1967-present	25	.2	Sanitary sewer
Film	1967-1973	<60	<1080	Old Incinerator
Film	1974-1979	<60	<1080	Contract disposal
Film	1979-present	60	1080	New Incinerator
Plating Laboratory				
KB-1B developer	1954-present	320	7	Contract disposal
CXB additive	1954-present	98	2	Contract disposal
CXA additive	1954-present	10	.2	Contract disposal
NP-A additive	1954-present	20	.5	Contract disposal
9E catalyst	1954-present	47	1	Contract disposal

* Unless otherwise noted.

Table 5-1 (contd.)

Waste Generation Rates and Total Wastes Generated
at NWIRP Bedford, 1954-1985

Source and Waste Type	Period of Generation	Waste Generation Rate (Gallons* per Year)	Total Waste (Thousands of Gallons*)	Treatment or Disposal Method
Plating Laboratory (contd.)				
80A prebond	1954-present	110	2	Contract disposal
80B prebond	1954-present	120	3	Contract disposal
Stannous fluoroborate	1954-present	44	1	Contract disposal
Lead fluoroborate	1954-present	8	.2	Contract disposal
Fluoroboric acid	1954-present	174	4	Contract disposal
Ammonium bifluoride	1954-present	306 pounds	7,000 pounds	Contract disposal
Hydrochloric acid	1954-present	220	5	Contract disposal
Sulfuric acid	1954-present	658	15	Contract disposal
839092 replenisher	1954-present	6690	150	Contract disposal
Solder stripper	1954-present	98	2	Contract disposal
301A fusing fluid	1954-present	288	7	Contract disposal
Sodium persulfate	1954-present	3360	80,000 pounds	Contract disposal
Co-Bre etch	1954-present	180 pounds	4,000 pounds	Contract disposal
White pumus	1954-present	720 pounds	17,000 pounds	Contract disposal
Copper chunks	1954-present	1640 pounds	40,000 pounds	Contract disposal
Finish solution	1954-present	340	8	Contract disposal
1175A cleaner conditioner	1954-present	18	.4	Contract disposal
Copper sulfate	1954-present	96	2,000 pounds	Contract disposal
Air Brite Pre Clean	1954-present	90	2	Contract disposal
328 A Cuposit solution	1954-present	110	2	Contract disposal
328 Q Cuposit solution	1954-present	110	2	Contract disposal
328 C Cuposit solution	1954-present	76	1.7	Contract disposal
748 etch preposit	1954-present	874 pounds	19,000 pounds	Contract disposal
68 Neutra Clean	1954-present	143	3	Contract disposal
19 accelerator	1954-present	46	1.4	Contract disposal
MLB 217 conditioner	1954-present	17	.4	Contract disposal

* Unless otherwise noted.

5.2.1 Components Laboratory. The Components Laboratory was built on the top of Hartwell's Hill in 1954. The laboratory is a three-story structure having a total floor area of 172,094 square feet. Shops, laboratories, and offices are found on all floors.

5.2.1.1 Photo Lab. The main photographic laboratory at NWIRP Bedford has been located in the Components Laboratory since 1961. This lab does color and black-and-white development for the activity.

The usage of photographic chemicals is summarized in Table 5-1. All spent rinse waters are disposed of to the municipal sanitary sewers. The concentrated developer solutions are replenished during use. There is almost no disposal of developer chemicals. Spent fixer solutions are disposal of down the sanitary sewers after passing through a silver reclamation unit.

Other chemicals used by the Photo Lab include acetic acid, sodium hydroxide, potassium hydroxide, ammonium hydroxide, and sulfuric acid. About 1 gallon of each of these chemicals is used each year.

During the last 10 years there has been a steady increase in the volume of color development and a corresponding decrease in the volume of black-and-white development done by the Photo Lab. It is estimated that the present quantity of color work is two times the long-term average, and that the black-and-white work is about one-half of the former level.

Several older types of color development chemistry have been replaced by more modern processes. The color processes known as E-3 and C-22 were used before the switch to E-6 and C-41, respectively. A small amount of E-4 development also was done. Ektachrome processes 3 and 4 (E-3 and E-4) involve non-biodegradable photo developers; E-3 and E-4 were discontinued 6 to 8 years ago. E-6 has been used since that time, and involves only biodegradable chemicals. Color print developer process 22 (C-22) involves some non-biodegradable chemicals; it was discontinued at NWIRP Bedford 10 years ago. Color process C-41 replaced C-22; it involves only biodegradable chemicals.

All empty containers are disposed of to the trash. These containers are disposed of off-activity with the general solid waste from the activity.

In past years, photographic chemicals could produce heavy metals or organic pollutants. It is possible that heavy metal-containing liquids were drained off-activity through the sanitary sewers early in the activity's history. Films were burned at the Old Incinerator from early in the activity's history until 1973. Since 1979, films have been disposed off-activity.

5.2.1.2 Machine Shop. The Machine Shop in the basement of the Components Laboratory is responsible for fabricating parts for prototype engineering designs. The current staff of 45 can be categorized into four major groups: machinists (30); sheet metal workers (12); welders (2); and one solderer. The fabrication of parts involves four major steps: milling, turning, forming, and joining. Many types of equipment are used to fabricate parts, including drill presses, table saws, metal lathes, and assorted forming equipment. Various cutting and lubricating oils, coolants, hydraulic fluids, and cleaners are used for equipment operation and materials production activities. Industrial chemicals are ordered just like other supplies (nuts, bolts, metal fittings, rags) through the Supply Department, and are picked up or delivered to the respective shops.

Cutting oils and coolants are the substances used in the greatest volume. Combined, their use creates 2,600 gallons of waste annually. Approximately 660 gallons of 1,1,1-trichloroethane per year have been used as a degreasing agent over the last 5 years. Maintenance of the Machine Shop equipment (oiling, changing oil in compressors during the annual activity shutdown, etc.) is performed by oilers from the Facility Maintenance Department. Approximately 40 gallons of hydraulic waste oil are generated each year during these maintenance activities in the shop. Waste flammable solvents account for another 660 gallons per year. These practices have been in effect since 1954.

Wastes (oils, coolants, degreasing agents, etc.) are, and always have been, segregated by type, placed in cans or drums, and taken to assigned temporary storage locations immediately outside the shops. Millwrights are called to pick up the wastes and remove them to the Hazardous Waste Storage Shed. The wastes remain at this storage shed until private contractors come to remove them from the activity (waste oils were placed in the underground tank near the Government Building from the late 1960's until 1977). These practices have been in effect since 1954.

5.2.1.3 Paint Spray Shop. Small, engineered prototype parts are spray painted and/or stenciled at NWIRP Bedford's spray paint booth, located in the Components Laboratory. Spray painting typically occurs for 3 to 4 hours per day, 5 days per week. Primers, enamel, and epoxy paints are used. Chemicals for thinning and cleaning are stored in a safety cabinet. Supplies are replenished by ordering through the Supply Department. The industrial chemicals most frequently used in the Paint Spray Shop are listed in Table 5-1.

The booth employs a dry air quality control system with a fibrous matt to filter emissions. The matting is changed about once per week and is discarded with the trash; trash is disposed in a dumpster, and is removed off-activity by a private contractor. The amount of each chemical listed in Table 5-1 represents the 10 percent of that chemical that becomes waste.

Liquid wastes are collected in 55-gallon drums. The Facility Maintenance Department is called to remove the drums when they are filled to capacity. These wastes are taken to the Hazardous Waste Storage Shed until a private contractor can come to remove the drums.

5.2.1.4 Engineering Analysis and Testing Department. This department conducts hydraulic and electromechanical tests of control actuators. Only small amounts of industrial chemicals are used, so waste volumes generated are relatively small. The major chemicals used include acetone, alcohol, hydraulic oils, and freon. The department generates about 5 gallons each of waste oil, flammables, and non-flammables per month. Wastes are kept in

5-gallon cans, which are placed in the temporary storage area at the Components Laboratory loading dock until they can be removed by the Facility Maintenance Department. These practices have been in effect since early in the activity's history (mid-1950's).

5.2.1.5 Metallurgical and Device Analysis Laboratory. The primary function of this laboratory is to conduct construction failure analysis of electrical and mechanical components. As part of this analysis, parts may undergo salt spray, shaker/vibration, thermal, weather, and X-ray tests. Samples of plating bath liquids used in the Chromate Lab are also tested regularly by lab personnel. However, the use of chemicals in the lab is minimal. The most commonly used chemicals and volumes generated are listed in Table 5-1.

Waste chemicals are segregated into several categories and stored in carboys. The Facility Maintenance Department collects the carboys every 2 to 3 months and removes them to the Hazardous Waste Storage Shed. Chemicals observed to be beyond their expiration dates during annual inventory checks are taken to the Hazardous Waste Storage Shed until they can be removed from the activity by an outside contractor. NWIRP Bedford adopted these practices in 1954.

The X-ray equipment has been serviced regularly by the company that installed the equipment 22 years ago. Company personnel clean developing and fixing solutions, oils, residues, water, and detergent rinses and remove the wastes from the activity.

5.2.1.6 Telephone Exchange. The telephone system at NWIRP Bedford is powered by a battery bank cascade consisting of 30 24-volt batteries that are located in the Components Laboratory. The present system has been in operation since 1953. The batteries are serviced by the local telephone company. When bad batteries are identified, they are removed by phone company personnel. This operation does not generate any waste.

5.2.1.7 Radar Laboratory. This laboratory tests and repairs electronic equipment. No waste is generated by this laboratory.

5.2.1.8 Chromate Laboratory. The Chromate Laboratory has been located in the Components Laboratory since 1975. This lab does experimental chromate coatings of test components.

Rinse waters are neutralized by the treatment system at the end of the coating line and discharged to the sanitary sewer. Before the treatment system was constructed in early 1984, about 1,800 gallons of high strength acidic rinses per year were placed in barrels for disposal. The process tanks contain dilute nitric acid, chromic acid, acetone, and rinse waters, which, since early 1984, have been neutralized and sent to the sanitary sewer. A total of 200 gallons each per year of waste nitric and chromic acid are produced. These wastes have always been collected in drums and disposed of off-activity. The contents of the degreasing tank (100 gallons of acetone) are disposed of once a year.

Empty nitric and chromic acid containers are recycled back to the manufacturer of the chemicals. Containers from other chemicals are disposed of off-activity with general trash.

The Chromate Laboratory has been in constant production for the 10 years of its existence. It is estimated that the current level of waste production has also been constant throughout this time period.

5.2.1.9 Printed Circuit Board Etch Facility. The Printed Circuit Board Etch Facility in the Components Laboratory has been in its present location since 1965. Before this date, a smaller laboratory was located off Navy property. Only experimental circuit boards are etched in this shop. Final production quantities of printed circuit boards are etched in other Raytheon buildings off Navy property.

The chemicals used and disposed of by this shop are listed in Table 5-1. It is estimated that the current levels of production are about twice the long-term average. All empty containers are disposed of with general trash. These containers are disposed of off-activity with the general solid waste from the activity.

The cupric etch solution is collected into drums for shipment back to the supplier for reclamation. All other chemicals are disposed of down the sanitary drains.

5.2.2 AMRAD Building. The AMRAD Building has an area of 5,123 square feet and was built in 1962. It has housed a variety of electronic and other programs over the years as these programs have expanded from the Components Laboratory. The most notable program was the Patriot antenna project in the late 1970's and early 1980's. More recently the AMRAD Building was used for repainting Retrofil missile batteries, a limited operation. No hazardous wastes have been generated in the AMRAD Building.

Miscellaneous office wastes were burned at the Old Incinerator from early in activity history until 1973. From 1974 to 1979, these wastes were disposed of off-activity by a private contractor. Since 1979, the wastes have been burned at the new incinerator.

5.2.3 Hawk Van Building. The Hawk Van Building is located just off the northeast corner of the Components Laboratory. Most of this structure is used for furniture storage. There is a welding shop in the east end that generates about 240 gallons of acid waste (left over from metal cleaning) per year. This waste is placed in acid-resistant barrels for off-activity disposal. These practices have been in effect since 1954.

5.2.4 Antenna Range Building. This building was built in 1970 and serves as the control center for Antenna Range work. It has a cobalt-60 radiation source that is used to simulate a high voltage breakdown of the wave guide at the range. The radioactive cobalt is shipped by Raytheon to Hanford, Washington, for disposal when it is too weak for further use. Other than the spent cobalt, this facility generates only paper and sanitary wastes.

5.2.5 Facility Storage Building. This structure was built in 1969. Since then the eastern end has been used as a maintenance area for trucks and missile launchers, operations which generate about 330 gallons of waste oil per year. Waste oil is removed off-activity by a private contractor. The central part of the building is an open work space for fitting and mounting equipment. No wastes are generated from this section of the building.

The west end of the building was used as a warehouse for government storage until 1981, when it was converted to a print shop for the newly created Publications Department.

The chemicals used by the Publications Department are inks (1,000 pounds per year); 777 Blanket Wash (330 gallons per year); and Press Clean solvent (55 gallons per year). The inks are all consumed during use. The Press Clean solvent is a kerosene-like solvent that is collected in a 55-gallon drum for disposal. About half of it evaporates; solvent that does not evaporate is recycled by the manufacturer. The 777 Blanket Wash is a solvent which contains high concentrations of 1,1,1-trichloroethane. Most of this solvent evaporates during use, and the empty drums are recycled by the manufacturer; the portion of the Blanket Wash that does not evaporate is recycled by the manufacturer.

Cyanide wastes (about 100 gallons per year) are also generated by the Publications Department. These wastes are placed in barrels for disposal. Empty ink containers are disposed of with general trash. Very little ink is disposed of because most of it is consumed during use.

5.2.6 Plating Laboratory. The Plating Laboratory is located in two adjacent buildings, the new Plating Building and the Hawk Building. These two buildings have housed the plating operation since the original Plating Laboratory was destroyed by fire in 1968. Although called the Plating Laboratory, this new "laboratory" is actually a small-scale printed circuit etch and fabrication facility with limited electroplating capacity.

The original Plating Laboratory, which was located on the site of the new Plating Building, was a more typical plating laboratory. The former Plating Laboratory was not rebuilt after the fire. During the fire all chemicals were removed and tanks emptied for off-activity disposal. No wastes were spilled during the process.

Chemicals which are used by the Plating Laboratory are listed in Table 5-1. The current consumption rate has been constant for the last 4 years. Up until that time, the consumption rate was about two-thirds of the current level. All of the chemicals listed are disposed of after use. All chemicals are disposed of by a private contractor.

Until 1985, rinse waters from the printed circuit board operations were disposed of down the main sanitary drains. Since 1985, a waste water treatment plant has been used to treat rinse waters, and these rinse waters are now recycled for reuse. All high strength wastes have always been drummed for off-activity disposal.

All empty containers are disposed of with general trash. These containers are disposed of off-activity with the general solid waste from the activity.

5.2.7 **Flight Test Facility.** The Flight Test Facility was built in 1959 and has 95,000 square feet of floor area. The main floor is used to stock and do minor maintenance on aircraft and to fit them with radar equipment. Waste motor oil (220 gallons per year) is generated by aircraft maintenance operations. The waste oil is stored in barrels and disposed of by a private contractor. This waste generation rate has been constant over the life of this facility.

The first floor and upper floor wings of the Flight Test Facility contain small electronic labs, engineering shops, computer rooms, offices, and a lunch room. These labs, shops, and offices generate only paper wastes, which are disposed of with general trash.

5.2.8 **Old Hangar.** The Old Hangar was built in 1952 prior to Navy acquisition of the activity. This hangar is used for storage of government equipment. There are two shops attached to the Old Hangar that generate wastes.

5.2.8.1 Paint Shop. The current location of the Paint Shop is in the Old Hangar. Until 1960 the Paint Shop was located in the Components Laboratory. The current usage of paint and chemicals is summarized in Table 5-1. All paints which are used by this shop are stored on Navy property. New paints are stored in a storage room adjacent to the Guards Locker Building; opened cans of paint are stored in the Paint Shop. Only about one-third of all the paint used by this shop is used on Navy property; the majority of all chemicals and paints used by the Paint Shop are used for painting jobs at other Raytheon buildings in the vicinity of but not actually on NWIRP Bedford (Navy-owned) property.

The current consumption rates of paints and chemicals are greater than they were in the past. It is estimated that the long-term average use rate was 80 percent of the current usage rate.

Most of the chemicals and paints currently being used are the same ones that were used when the Paint Shop was located in the Components Laboratory. Two chemicals have been discontinued since then: toluene and shellac. Forty gallons of toluene and 15 gallons of shellac were used per year; the use of shellac was discontinued in 1960, and toluene was used until 1968.

All empty containers are disposed of off-activity with the general solid waste from the activity. Waste paints are currently placed in drums and hauled away for off-activity disposal. Until 1968, small quantities (about 2 percent) were burned at the Fire Fighting Training Area just off Navy property on the north side of Forest Road. Paint wastes also were burned in the Old Incinerator until 1973. Since 1974, paints have been disposed of off-activity. The ash from the burned paint was disposed of at Site 1, Old Incinerator Ash Disposal Areas.

5.2.8.2 Boiler Maintenance Shop. The Boiler Maintenance Shop is located in the Old Hangar. This shop has been located in this building since a separate boiler shop was established in 1963, and is responsible for the maintenance of all heating and air-conditioning equipment on Navy property. This equipment includes two boilers at the Flight Test Facility, two at the Components Laboratory, and one each at the Government Building, the Old Hangar, the Hawk Building, the Plating Laboratory, and the Publications Department, which is located in the Facility Storage Building. Water treatment for boilers is located at the Old Hangar, the Flight Test Facility, and the Hawk Building.

The chemicals used for boiler water treatment and boiler maintenance are summarized in Table 5-1. All of these chemicals are consumed in use or are removed in the boiler blowdown which is discharged to the sanitary sewer. The current consumption of these chemicals would be about equal to the long-term average. The Dearborn chemicals have replaced Aqualab chemicals, which were used in the same manner. All empty containers are disposed of off-activity with the general solid waste from the activity.

5.2.9 Lark Building. This building is part of the Publications Department. Small-scale photo reproduction equipment and copy machines are located in this area. The chemicals used by the Publications Department are summarized in Table 5-1. Current rates of consumption of these chemicals are about equal to the long-term average.

Silk-screen printing also used to take place in the Lark Building. This operation was discontinued about 1979.

All chemicals used in this building are diluted with water and washed down the sanitary drain. The fixers from the photographic processes are not recycled to remove silver at the present time but silver recovery is planned for the future. All empty containers are disposed of with general trash. These containers are disposed of off-activity with the general solid waste from the activity.

5.2.10 Van Duesen Building. The Van Duesen Building is used for offices. Previously, the building was used for storage of Hawk missile equipment and was the location of the research and development office of the Plating Laboratory. No hazardous wastes have been generated by operations carried out in this building.

5.2.11 Microphotographic Laboratory. The Microphotographic Laboratory is located in the Van Duesen Building Complex, Buildings T-8 and T-9. This laboratory has been located in these buildings since its inception in 1967.

The usage of photographic chemicals is summarized in Table 5-1. All spent rinse waters are disposed of down the drain. The concentrated developer solutions are diluted with water and also disposed of down the sanitary drain. Spent fixer solutions are disposed of down the drain after passing through a silver recovery unit which reclaims the silver; silver recovery began in 1975. Prior to silver recovery, silver-containing solutions were disposed of in the sanitary sewer. Toner from the copy machine is collected and hauled off-activity for disposal.

The total volume of the work processed by the Microphotographic Laboratory has greatly increased in recent years. It is estimated that the current consumption of chemicals is about four times what it was 10 years ago.

5.2.12 Government Building. The Government Building was built in 1968 and has 10,512 square feet of space. This building has always been used for office space and generates no wastes except for non-hazardous office and sanitary wastes.

5.3 PESTICIDE OPERATIONS. Pesticides are applied by a private contractor for the purpose of controlling roach, weed, and termite populations. The cafeteria is sprayed for roaches on a monthly basis. Weeds growing along the activity's perimeter fence are sprayed annually. Termite infestation in wooden buildings is dealt with "as needed" (Raytheon Company correspondence, 1979). No pesticides are presently stored on the activity, nor have any been stored on the activity at any time in the past.

From the 1950's to 1979, pesticides were mixed on the activity. No spills of pesticides occured at NWIRP Bedford during this time. Leftover pesticides were removed by a private contractor. Since 1979 no pesticides have been mixed on the activity, and all pest control operations have been handled by a private contractor.

5.4 OIL/WATER SEPARATION. The jet fuel storage area, located south of the Old Hangar at the southeast corner of the activity, contains four 10,000-gallon underground tanks. Two Viking rotary pumps and Griggs filter-separators serve the four tanks. A 1,000-gallon underground tank is located between the two pump-filter-separator systems. This tank receives water condensate and slop oil from the pump-separator systems.

Two fueling stations for loading the jet fuel are provided for the four 10,000-gallon tanks. These fueling stations each have a filter-separator system and an adjacent 500-gallon tank for condensate and slop oils.

Thus, a 1,000-gallon underground tank and two 500-gallon tanks operate in the jet fuel storage area. Additionally, a total of four pump-separator-filter systems operate in the jet fuel storage area. There are no reported instances of leaks or spills in the area. The tanks are periodically pumped by a private contractor, and wastes are disposed of off-activity.

CHAPTER 6. MATERIAL HANDLING: STORAGE AND TRANSPORTATION

6.1 NEW MATERIALS.

6.1.1 **Ordnance Storage.** Ordnance is stored in an ammunition storage building. This building is an earth-covered bunker located to the east of the Advanced Medium Range Air-to-Air Missile Development (AMRAD) Building. The only ordnance stored in this bunker are starter charges for test engines. Because experiments are underway on the long-term stability of these starting charges, several are being stored beyond their rated expiration date. Three-week supplies of these charges are issued for off-activity use at the Raytheon Spencer Building.

6.1.2 **Chemical and Hazardous Material Storage.** Bulk quantities of chemicals used at Naval Weapons Industrial Reserve Plant (NWIRP) Bedford are delivered by vendors to the Hazardous Waste Storage Shed (since 1981) or to the Plating Laboratory Storage Area. Prior to 1981, they were delivered to the Generator Pad Storage Area. Millwrights from the Stores Department in the Components Laboratory have always been responsible for moving new chemicals from these primary storage areas to the areas where they are used or dispensed. There have been no reported spill incidents involving hazardous materials at NWIRP Bedford.

6.1.2.1 Hazardous Waste Storage Shed. Chemicals are stored in the Hazardous Waste Storage Shed (built in 1981) by compatibility class. Table 6-1 lists the chemicals currently stored there in 5- and 30-gallon drums or in boxes. From the Hazardous Waste Storage Shed, chemicals are carried in their original containers as needed to the Bulk Chemical Storage Shed immediately to the north of the Components Laboratory, from which the chemicals are dispensed. Before the Hazardous Waste Storage Shed was built, flammable chemicals were stored in barrels on a Generator Pad that previously occupied the area where the shed now stands. No spills have been reported at the Hazardous Waste Storage Shed.

6.1.2.2 Bulk Chemical Storage Shed. This shed (Building 4) is made up of three sections: the Inflammable Storage Section, the Acid Storage Section, and the Gas Cylinder Storage Section. Since 1954, 5-gallon and smaller quantities of liquid chemicals have been dispensed from the Inflammable Storage Section into safety cans for delivery, primarily to the Components Laboratory.

6.1.2.3 Chemical Storage Building. The Chemical Storage Building is attached to the Plating Laboratory (Building T-210); chemicals stored there are used in the Plating Laboratory. Chemicals stored in this area are stored first in the Bulk Chemical Storage Shed adjacent to the Components Laboratory or in the Hazardous Waste Storage Shed, and are brought to the Chemical Storage Building as needed. There have been no reported spills at the Chemical Storage Building.

Table 6-1

Chemicals Stored in the Hazardous Waste Storage Shed,
NWIRP Bedford, Massachusetts

Class	Chemical	Class	Chemical
Corrosive	Ammonium fluoride	Flammable	Acetone
	Ammonium hydroxide		Isopropyl alcohol
	Freon		Methanol
	Hydrochloric acid		N-Butyl acetate
	Hydrofluoric acid		Propanol
	Hydrogen peroxide		Xylene
	J-100 photo resist		
	Sulfuric acid		
	Nitric acid	Organic	Genasolv-D electrolyte
	Phosphoric acid		Genesolv-D standard
	Sodium hydroxide (s)		Cobehn spray
	Sodium hydroxide (1)		Tetrachloroethylene
	Potassium hydroxide (s)		Trichloroethane
			Trichloroethylene

6.1.2.4 Plating Laboratory Storage Area. The Plating Laboratory Storage Area is located outside of the Plating Laboratory (Building T-210). The principal use of this area is storage of wastes generated by the Plating Laboratory, and other waste generators in the south end of the activity. There have been no reported spills at the Plating Laboratory Storage Area.

Virgin chemicals to be used in Plating Laboratory operations are stored in the Plating Laboratory itself, so new and used chemicals are never in close proximity.

6.1.2.5 Paint Lockers. Partially used containers of paint are stored in the Paint Shop Storage Locker. This locker is protected by a fire sprinkler system, and is located in the Old Hangar. No spills or accidents have ever been reported.

New paints are stored in a separate paint storage locker adjacent to the Guard's Locker Building (adjacent to the concrete apron in front of Building T-217). This storage locker is equipped with a dry chemical fire control system. No spills or accidents have ever been reported at this paint storage locker.

6.1.2.6 Generator Pad Storage Area. Before the Hazardous Waste Storage Shed was constructed in 1981, there were racks on the Generator Pad (southeast of the AMRAD Building) where drums of new solvents were stored. (The Generator Pad was an open-walled concrete structure with a paved floor.)

In 1977, about 250 gallons of diesel oil were spilled on the asphalt in front of the Generator Pad Storage Area. The spilled oil caused the disintegration of the asphalt. A contractor was hired to contain the spill and to remove the oil, the damaged asphalt, and the contaminated soil from the activity. This area was restored to its original condition and repaved. The oil-soaked asphalt and soil were removed from the activity for disposal.

All detectable contaminated soil and asphalt was excavated and removed from the spill area (Bunar, personal communication, 1986). Furthermore, it is reported that measures to contain and retrieve the oil were initiated within a few days of the spill. Hence, there was little time for the diesel oil to infiltrate the ground and migrate, especially considering that the area was asphalt-paved. Hence, it is unlikely that any oil remains at the site.

6.1.3 <u>Petroleum, Oils, and Lubricants (POL's)</u>. The major underground fuel storage facilities in use at NWIRP Bedford are listed in Table 6-2. These facilities provide a total storage capacity of approximately 126,600 gallons.

A 2,000-gallon underground tank near the Government Building had been used for storage of waste POL's. Use of this tank was discontinued in 1977, and in 1980 it was removed. No evidence of leakage or spillage was observed.

Table 6-2

Underground Storage Tanks at NWIRP Bedford, Massachusetts

Tank No.	Capacity (Gallons)	Location	Material stored
1	7,600	Transportation	gasoline
			Building
2	1,000	Hawk Van Building	diesel fuel
3	20,000	Components Lab	#6 fuel oil
4	15,000	Components Lab	#6 fuel oil
5	1,000	Plating Lab	#2 fuel oil
6*	10,000	Guard's Locker Bldg.	80-octane AVGAS
7*	6,000	Guard's Locker Bldg.	100-octane AVGAS
8	500	Old Hangar	#2 fuel oil
9	500	Old Hangar	#2 fuel oil
10,11, 12,13	10,000 (each)	Pumping Station	jet fuel
14	10,000	Flight Test Facility	#6 fuel oil
15	15,000	Flight Test Facility	#6 fuel oil

* not on Navy-owned property

In 1982, a leak from the 20,000-gallon underground fuel tank at the Components Laboratory (Site 2) resulted in the penetration of about 200 gallons of #6 fuel oil into the surrounding soil. The tank was subsequently emptied, the contaminated ground was excavated, and the contaminated soil was removed off-activity. Additionally, an oil/water separator was installed to catch additional contaminant from the spill. Both the tank and the oil/water separator remain in place. No studies have been performed to determine if any of the surrounding ground is still contaminated.

6.1.4 Pesticides. Pest control is performed by an outside contractor, and pesticides are stored off-activity. Until the early 1980's, pesticides were mixed indoors on the activity. The drains serving the mixing area are connected to the sanitary sewer. Since the early 1980's, pesticides have been mixed off-activity. Pesticides are used to control termites and weeds.

6.1.5 Transformers. There are a total of 16 transformers at NWIRP Bedford, four of which contain polychlorinated biphenyls (PCB's). Three of the PCB-containing transformers fall into the PCB-Contaminated range, a legal designation meaning that concentration of PCB's falls within a range of 50 to 500 parts per million (ppm); two of the PCB-contaminated transformers are not in service. The fourth PCB transformer, located on a gravel pad about 10 feet away from the AMRAD Building, contains 150 gallons of dielectric fluid with a PCB concentration of 650 ppm; this transformer is designated as being in the PCB Transformer range because the PCB concentration is over 500 ppm. This transformer has not been serviced since July 1, 1985, in accordance with government regulations. All four transformers (three in the PCB Contaminated range and one in the PCB Transformer range) are located outdoors, rather than inside buildings. Inspection reports show all transformers to be sound with no signs of leakage. All were tested for PCB levels within the past 6 years. There is no record of any spill incident involving transformers containing PCB.

Until 1981, transformers no longer in use at NWIRP Bedford were stored on an asphalt surface immediately to the east of the Balloon Building before being shipped to the Raytheon warehouse at North Dighton; no spills of PCB oils at the Balloon Building have been reported. Since 1981, NWIRP Bedford has contracted to have equipment containing PCB's removed directly from the former point of use.

At present (February 1986), there are two PCB-containing capacitors located on Navy property. These are in "stored disposal," meaning that they are being stored on Navy property and are slated for disposal. The capacitors are stored at the Flight Test Facility.

6.2 WASTE MATERIAL. Waste chemicals are accumulated at the point of use in the various labs and shops. When containers are full, they are sealed and labeled. The Plant Engineering Department is called to arrange pickup. Wastes from the south end of the activity are temporarily stored at the Plating Laboratory Storage Area before being removed from the activity by a contractor. Wastes from the north end of the activity were stored at the Old Barrel Storage Area north of the Components Laboratory before 1981; since then, these wastes have been stored at the Hazardous Waste Storage Shed. There have been no reported spills of waste materials.

6.2.1 __**Old Barrel Storage Area**__. The Old Barrel Storage Area was located about 100 feet west of the Government Building. This area served as the hazardous waste collection point for NWIRP Bedford from the late 1960's until 1981, when the Hazardous Waste Storage Shed was built. Barrels of waste solvents and oil from the north end of the activity were brought to this area for storage. Waste solvents and concentrated aqueous wastes were stored in barrels on the ground, while waste POL's were stored in a 2,000-gallon underground tank. Oily wastes from the Components Laboratory were stored in a large metal tank outside the Machine Shop. When this tank was full it was carried via forklift truck to the waste storage area and emptied into the underground tank. The wastes in barrels and the contents of the tank were removed from the activity annually by a private contractor; the volume of waste materials ranged from 500 to 1,500 gallons per year. Empty barrels were stored here until needed by a waste-generating lab or shop. In about 1977, use of the underground tank near the Components Laboratory was discontinued; wastes have been stored entirely in barrels since then, first at the Old Barrel Storage Area (1977 to 1981), then at the Hazardous Waste Storage Shed (since 1981). The underground tank was pumped for the last time in 1977 and removed. Inspection showed it to be free of leaks. Although the topsoil around the tank was contaminated with oil, there was no sign of waste contamination in the deeper soils surrounding the tank, and there is little likelihood that the area remains contaminated (Bunar, personal communication, 1986). The tank and contaminated soil were removed from the activity for disposal.

Wastes from Raytheon's Systems Laboratory, located immediately to the west of NWIRP Bedford, were trucked to the Old Barrel Storage Area between 1979 and 1981. These wastes were temporarily stored here with other wastes before being removed from the activity by a contractor. No leaks or spills were ever reported.

6.2.2 __**Hazardous Waste Storage Shed**__. The Hazardous Waste Storage Shed was constructed in 1981. Since then, all hazardous wastes from the Components Laboratory and other shops in the north end of the activity have been brought to this shed for temporary storage prior to being shipped off-activity. This shed provides secure, segregated, and sheltered storage for hazardous waste; it includes dikes to contain possible spills and special construction features for fire and explosion protection. Waste solvent, POL's, and toxic water-soluble wastes are stored by compatibility class in separate areas of the shed.

6.2.3 __**Plating Laboratory Storage Area**__. Wastes from the Plating Laboratory and minor waste generators in the south end of NWIRP Bedford have always been stored in the Plating Laboratory Storage Area located immediately to the east of the Plating Laboratory. Wastes stored here include acids, bases, solvents, paint sludges, and metal sludges from waste treatment processes. These wastes are stored in barrels until they are picked up by a contractor for off-activity disposal. There have been no reported spills at the Plating Laboratory Storage Area. Practices discussed here have remained unchanged since 1954.

6.2.4 Scrap Metal Storage Shed. The Scrap Metal Storage Shed is located about 120 feet east of the northeast corner of the Components Laboratory. Scrap metal from the Components Laboratory Machine Shop has been stored in 55-gallon drums in this shed while awaiting pickup by a scrap metal contractor. There are no hazardous materials at the Scrap Metal Storage Shed. There have been no reported spills.

6.2.5 Scrap Piles. There are two scrap piles on the grounds of NWIRP Bedford. They are both small, with each one covering less than 500 square feet.

The Government Building Scrap Pile is located just to the east of the Government Building and consists of discarded air-conditioning and refrigeration units and miscellaneous small appliances. These items are stored here until they are periodically removed by the Defense Reutilization and Mobilization Office (DRMO) for sale or by a contractor for their scrap value.

The Scrap Metal Pile is located immediately to the east of the Scrap Metal Storage Shed. It contains miscellaneous pieces of scrap metal left over from structural and equipment fabrication operations at NWIRP Bedford. Scrap metal stored here and in the Scrap Metal Storage Shed consists mainly of aluminum and steel with minor amounts of copper, brass, and lead. The metals are picked up four times a year by a contractor who pays Raytheon fair market price for the scrap metal. Each year approximately 5 tons of solid and 1 ton of chip aluminum and 2.5 tons of solid and about 0.2 tons of chip steel are removed by the scrap metal contractor.

6.2.6 Solid Waste. NWIRP Bedford generates approximately 924 tons per year of solid waste consisting of paper, cardboard, wood, plastic, and garbage. Unclassified wastes are placed in dumpsters or compaction units at the larger buildings. When the dumpsters and compaction units are full, they are carried off-activity by a private hauler. Table 6-3 lists the amounts of solid wastes discarded by the major generators at the activity.

An additional 3 tons per year of computer paper are packaged separately and sold to an off-activity recycling plant. Classified paper and film comprising another 3 tons per year are also collected separately from other solid wastes and are destroyed. The ash was disposed of on the activity from 1953 until 1973 at Site 1, Old Incinerator Ash Disposal Areas.

Table 6-3

Average Annual Quantities of Solid Waste Generated by Facilities Within NWIRP Bedford, Massachusetts

Facility	Solid Waste (Tons per Year)
Components Laboratory	451
Flight Test Facility	451
Government Building	13
Old Hangar	3
Antenna Range	6
Total	924

CHAPTER 7. WASTE PROCESSING

7.1 SEWAGE TREATMENT. NWIRP Bedford has been served by centralized wastewater treatment facilities since the activity began operation in 1954. Presently, all raw wastes are ultimately piped to the sewage treatment facilities operated by the Boston Metropolitan District Commission (MDC) at Deer Island. Wastewater from the Components Laboratory and other buildings on the north side of NWIRP Bedford is first collected by the town of Bedford's sewer system. Wastes from the Flight Test Facility and other buildings on the south side of NWIRP Bedford flow into the Hanscom Field sewer system before being discharged to the MDC interceptor.

Several small structures on the activity had their own septic tanks and leach fields for disposal of domestic wastes from restrooms until these structures were hooked up to the MDC system in 1980. Prior to 1980, these septic systems were periodically cleaned by a contractor, who removed the effluent off-activity for disposal. The buildings that were served by septic systems are the Antenna Range Building, the Facility Storage Building, the Government Building, and the Lark Building. The old septic systems at these buildings remain in place even though they are no longer in use. Of these, only the Lark Building generates any hazardous waste, and this waste is accounted for by appropriate disposal practices.

About 4,000 gallons per day of process wastewater is neutralized by the Chromate Laboratory before being discharged to the sanitary sewer. Until late 1984 about 10,000 gallons per day of etch and rinse water from the Plating Laboratory were discharged to the sanitary sewer. Since then a new waste treatment system has neutralized acidic and caustic wastes and removed metals from dilute rinse waters by ion exchange. The treated rinse water is reused.

7.2 INCINERATION. Classified paper and film wastes (from the Photo Lab) are destroyed by incineration. The Old Incinerator was used between 1955 and 1973; it was located in the north end of the activity just to the west of the Transportation Building. In addition to paper and film, waste paint residuals were also burned in the Old Incinerator. Ash from this incinerator was disposed of at Site 1, Old Incinerator Ash Disposal Areas. In 1973, the new incinerator was built about 200 feet east of the AMRAD Building; however, due to startup difficulties, this incinerator did not begin burning wastes until 1979. During the 6-year period between 1973 and 1979 all classified wastes were taken off-activity for shredding and disposal. Ash from the new incinerator is placed in a dumpster and hauled off-activity by a contractor for disposal. About 3 tons of classified material are destroyed every year at NWIRP Bedford.

7.3 OIL/WATER SEPARATION. The jet fuel storage area, located south of the Old Hangar at the southeast corner of the activity, is comprised of four 10,000-gallon underground tanks. Two Viking rotary pumps and Griggs filter-separators serve the four tanks. A 1,000-gallon underground tank is located between the two pump-filter-separator systems. This tank receives water condensate and slop oil from the pump-separator systems.

Two fueling stations for loading the jet fuel are provided for the four 10,000-gallon tanks. These fueling stations each have a filter-separator system and an adjacent 500-gallon tank for condensate and slop oils.

Thus, a 1,000-gallon underground tank and two 500-gallon tanks operate in the jet fuel storage area. Additionally, a total of four pump-separator-filter systems operate in the jet fuel storage area. There are no reported instances of leaks or spills in the area. The tanks are periodically pumped by a private contractor, and wastes are disposed of off-activity.

An oil/water separator was located at the outflow of the storm water pipe that drains the northern part of the Components Laboratory. This separator was emplaced on May 6, 1982, to collect an oil/water mixture that was apparently leaking from the 20,000-gallon fuel oil tank situated at the northeast corner of the Components Laboratory. The oil/water separator remains in place, having collected about 2,000 gallons of the oil/water mixture; the 20,000-gallon tank from which the oil originated also remains empty and in place.

It is believed that the 2,000 gallons of oil/water mixture inludes the total amount of oil that leaked from the tank. All operations were performed by a private contractor.

CHAPTER 8. DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS

8.1 SITE 1, OLD INCINERATOR ASH DISPOSAL AREAS. Between 1954 and 1973, classified documents, including paper and film wastes, were burned in the Old Incinerator immediately south of the Antenna Range. Ash from the incinerator was discarded in the area around the incinerator and at the edge of the slope to the west of the Government Building. Figure 8-1 shows the location of the areas where ash was disposed of.

The first of these areas is located about 150 feet northwest of the Government Building. Grading for the Components Laboratory, parking areas, and access roads created a semicircular embankment in this area. Construction debris and incinerator ash were discarded over this embankment between 1953 and 1973. As this area was graded and fill materials were added, a plateau was created that was gradually extended to the north. Household trash, including old furniture, was placed in this disposal area by way of a road along the foot of the slope. Once, in the mid-1970's, empty cans and drums were found on the open face of the disposal area. These cans and drums were found to be empty and were removed off-activity for disposal. There is no record to indicate that hazardous wastes or any wastes other than the incinerator ash were ever placed in this disposal area.

About 3 tons per year of classified documents were incinerated from 1954 to 1973. In addition, small quantities of paint wastes, estimated to be about 115 gallons per year, were also incinerated. This site is of concern due to the potential presence of toxic heavy metals from film waste (silver) and from paint wastes (lead, chromium, and zinc). It is estimated that 75 percent of the classified material incinerated was comprised of paper and that 1 percent of the classified paper was made up of film waste. This amount of film would contain a total of about 2 pounds of silver over the 19-year period of concern. Similarly, the amounts of zinc, lead, and chromium (in the form of their oxides, derived from paint wastes estimated to be in ash) are about 20, 30, and 10 pounds per year, respectively, or about a total of 380 pounds, 570 pounds, and 190 pounds, respectively, over the 19-year period of concern. The slope face is covered with fill and is now partially vegetated. The portion of Site 1 around the Old Incinerator is now partially paved and the rest of the site is revegetated. There has not been any ash disposal at this site for 12 years.

The northernmost edges of the Old Incinerator Ash Disposal Areas are about 600 feet south of Elm Brook, a small tributary of the Shawsheen River. The soils between the site and Elm Brook are Swansea and Freetown mucks. The extremely slow drainage rates that these soils experience reduces the potential of cation migration. Moreover, with their high silt and moderate clay contents, cation adsorption capacity is further increased. Peat contained in these soils also increases the soils' cation adsorption capacity. Thus, the heavy metals of concern at Site 1 would be readily and completely adsorbed by these muck soils.

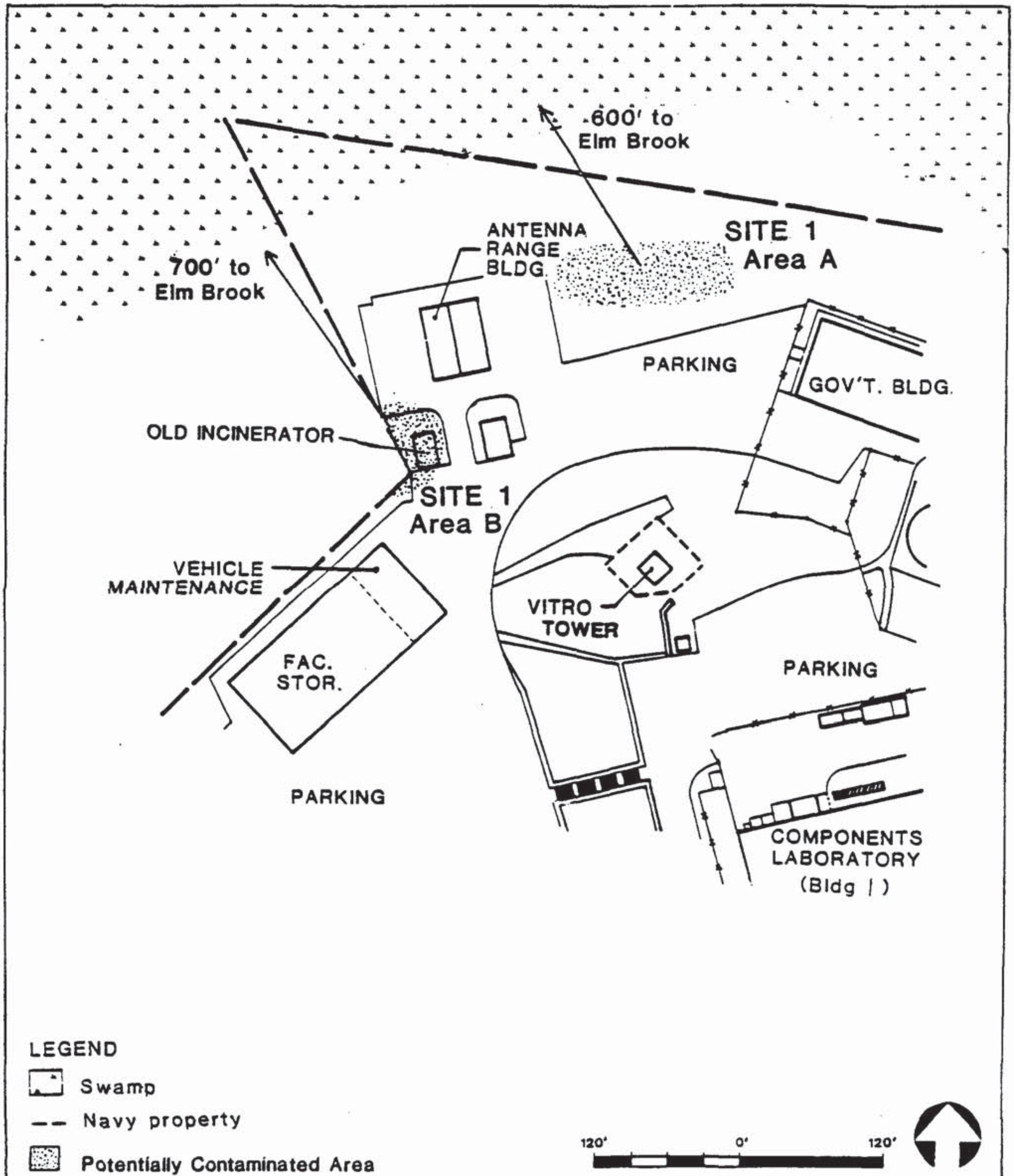

Figure 8-1

Site 1, Old Incinerator Ash Disposal Areas, NWIRP Bedford, Massachusetts

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Bedford, Massachusetts

There are no demonstrable migration pathways for these heavy metal pollutants, other than down the short slope to the muck soils. There are no receptors along the slope pathway.

8.2 SITE 2, COMPONENTS LABORATORY FUEL OIL TANK. In 1953 a 20,000-gallon underground tank for #6 fuel oil was installed at the northeast corner of the Components Laboratory (Figure 8-2). On April 22, 1982, activity personnel observed oil leaking to the ground on a grassy slope just to the southeast of the Transportation Building. The oil was leaking from the outfall of an 8-inch storm water drain. A private contractor acted to contain the oil, monitored the outfall, and determined the source of the oil.

The storm water pipe that drains the northern part of the Components Laboratory had intercepted and transported the oil. The apparent source of the oil was the 20,000-gallon fuel oil tank.

On May 6, 1982, an oil/water separator was installed at the outfall to trap the oil still emerging from the pipe. On May 11, oil in the tank was removed and the tank was taken out of service. Visual inspection of the tank after it was emptied revealed a hole 2 centimeters in diameter halfway up the side of the eastern face of the tank. Between May 6 and the end of May, nearly 2,000 gallons of mixed oil and water were trapped at the storm water outfall and several hundred gallons of oil-contaminated soil were scraped up and placed in drums for off-activity disposal. No other area downslope from the tank has shown evidence of oil contamination. Routine inventory of the oil level in the tank before and after the spill event showed that there was no perceptible change in level in the tank. A 1-inch drop at the widest point of a cylindrical tank like the one in question would represent the loss of no more than 200 gallons of oil. Hence, an estimate of the maximum amount of oil lost from the tank is 200 gallons. The tank remains unused and in place.

It is likely that the volume of oil from the tank that is unaccounted for would have been held in the immediate area of the tank by capillary forces. Any oil that did migrate through 400 feet of sandy soils to the foot of Hartwell's Hill would be adsorbed in the Swansea and Freetown mucks surrounding Hartwell's Hill.

The pathway to the foot of Hartwell's Hill runs through sandy soils beneath several buildings and paved areas of the activity before ending in the muck soils. There are no receptors along the pathway.

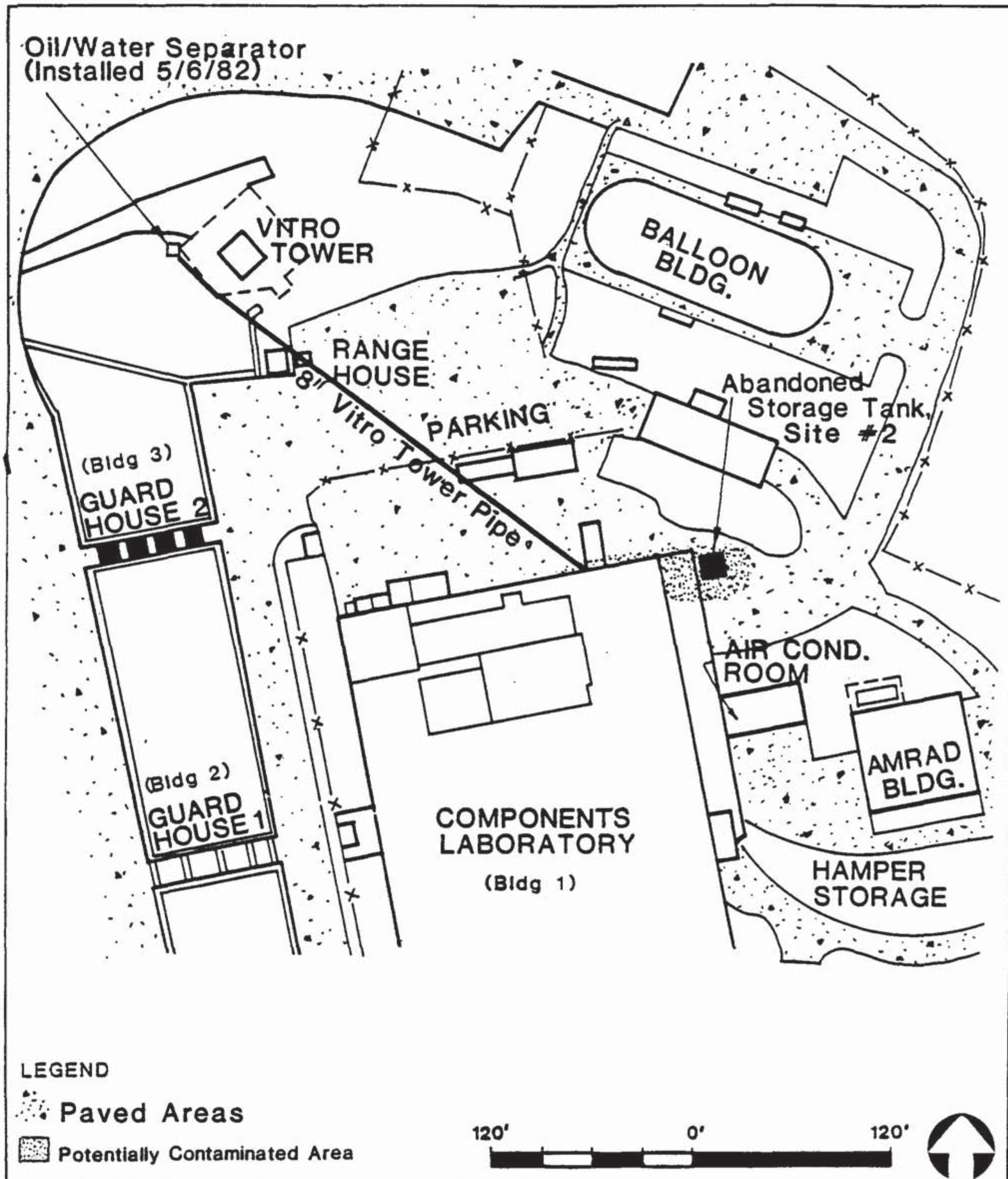

Figure 8-2

Site 2, Components Laboratory Fuel Oil Tank, NWIRP Bedford, Massachusetts

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Bedford, Massachusetts

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APPENDICES

APPENDIX A. SUMMARY OF SOURCES UTILIZED DURING THE RECORD SEARCH TASK OF IAS AT NWIRP BEDFORD

Naval Facilities and Engineering Command:	
NEESA, CBC	Port Hueneme, CA
Command Historian, CBC	Port Hueneme, CA
Administrative Microfiche File, CBC	Port Hueneme, CA
Real Estate Branch	Alexandria, VA
Command Headquarters	Alexandria, VA
Northern Division (Phila. Naval Base)	Philadelphia, PA
Environmental Engineering	
Environmental Planning	
Applied Biology	
Real Estate	
Contract Plans Microfiche Files	
National Archives	Washington, D.C.
National Archives, Cartographic Branch	Alexandria, VA
Naval Historical Center	Washington, DC
Ordnance Environmental Support Office	Indian Head, MD
Federal Records Center	Waltham, MA
DOD, Explosives Safety Branch	Alexandria, VA
Naval Weapons Industrial Reserve Plant (NWIRP)	Bedford, MA
Stores Department	
Plant Engineering Department	Bedford, PA
Health Office	
United States Geological Survey	Malvern, PA
Massachusetts Department of Environmental Quality Engineering	Boston, MA
Town of Bedford Department of Health	Bedford, MA
Town of Bedford Fire Department	Bedford, MA
U.S. Department of Agriculture, Soil Conservation Service	Littleton, MA

APPENDIX B. ACRONYMS

AMRAD	Advanced Medium Range Air-to-Air Missile Development
CDM	Camp Dresser and McKee
CEC	Cation Exchange Capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CNO	Chief of Naval Operations
CSRS	Confirmation Study Ranking System
DOD	Department of Defense
DOI	Department of Interior
DRMO	Defense Reutilization and Marketing Office (formerly DPDO - Defense Property Disposal Office)
EFD	Engineering Field Division
EPA	Environmental Protection Agency
FTF	Flight Test Facility
GOCO	Government-Owned, Company-Operated
IAS	Initial Assessment Study
MDC	Metropolitan District Commission
MSL	Mean Sea Level
NACIP	Navy Assessment and Control of Installation Pollutants
NAVFACENGCOM	Naval Facilities Engineering Command
NEESA	Naval Energy and Environmental Support Activity
NEPSS	Naval Environmental Protection Support Service
NIRAP	Naval Industrial Reserve Aircraft Plant
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NWIRP	Naval Weapons Industrial Reserve Plant
OESO	Ordnance Environmental Support Office
PCB	Polychlorinated Biphenyl
POL	Petroleum, Oils, and Lubricants
PPM	Parts Per Million
SCS	Soil Conservation Service
USDA	United States Department of Agriculture
USGS	United States Geological Survey